# MEASUREMENT OF PM<sub>10</sub> & PM<sub>2.5</sub> EMISSION FACTORS AT A STONE CRUSHING PLANT

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# Notation

	Notation	
English		ì
Symbol	<u>Description</u>	÷
		r,
Α	Area of stack or duct at sampling location	ì
$A_n$	Cross sectional area of sampling nozzle	,
	<u> </u>	!
$\mathfrak{b}_{\mathbf{f}}$	Average blockage factor	i.
$\mathbf{B_{ws}}$	Moisture content of gas stream	
C	Cunningham correction factor	4
$c_1$	Re-estimated Cunningham correction factor for particle diameter equivalent to the actual	1
	cut size diameter and calculated using the actual stack gas temperature	•
$C_{\mathbf{p}}$	Pitot coefficient for the combined cyclone pitot	1
•		
$C_{\mathbf{p}}'$	Coefficient for the pitot used in the preliminary traverse	d.
$C_{ ext{total}}^{r}$	Concentration of total filterable and condensable particulate	1
$C_{PM_{10}}$	Concentration of PM <sub>10</sub> filterable and condensable particulate	1
$^{\mathrm{C}_{\mathrm{PM}_{2.5}}}_{-}$	Concentration of PM <sub>2.5</sub> filterable and condensable particulate	
$D_{50}$	Particle cut diameter	
$D_{50_1}$	Re-calculated particle cut diameters based on re-estimated C <sub>1</sub> , (micrometers)	å
$\mathrm{D_{50}}_{\mathrm{LL}}$	Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for	i
	cyclone IV	å
$D_{50}$	Cyclone I cut diameter corresponding to the middle of the overlap zone between the	4
	cyclone I, 11.0 micrometer performance curve and the cyclone IV 2.25 micrometer	1
	performance curve.	1
I	Percent isokinetic sampling	Ċ
Kp	85.49, ft/s (pounds/mole -°R)	
м <sub>1</sub>	Solids recovered from sample jar 1, PM>10	
$M_2$		,
<del>-</del>	Solids recovered from sample jar 2, ≤10 and >2.5 PM	
M <sub>3</sub>	Solids recovered from sample jar 3, \$2.5 PM	;
M <sub>4</sub>	Milligrams of solids on the filter, ≤2.5 PM	i;
M <sub>202</sub>	Condensed material recovered from Method 202, ≤2.5 PM	1
Md	Molecular weight of dry gas	1
Mw	Molecular weight of wet gas	Ċ
N	Number of total traverse points	
$N_{re}$	Reynolds number	1
Qs	Sampling rate (ACFM) for cyclone I to achieve specified D <sub>50</sub>	4
$Q_{\mathbf{s}\mathbf{S}\mathbf{T}}$	Total dry gas flow rate(DSCFM) through the sampling assembly	į.
$Q_{\mathbf{I}}$	Sampling rate (ACFM) for cyclone I to achieve specified D <sub>50</sub>	4
$Q_{IV}$	Sampling rate (ACFM) for cyclone IV to achieve specified D <sub>50</sub>	1
Pbars	Barometric pressure	
P <sub>S</sub>	Absolute stack pressure	n N
R <sub>min</sub>	Stack/nozzle ratio, minimum velocity parameter	Ġ
	Stack/nozzle ratio, maximum velocity parameter  Stack/nozzle ratio, maximum velocity parameter	1
$R_{max}$	· · · · · · · · · · · · · · · · · · ·	
t <sub>r</sub>	Total projected run time	;
$t_{\mathbf{n}}$	Sampling time at point n	٠,

# Notation (Continued)

English	Description
<u>Symbol</u>	Description
t <sub>1</sub>	Sampling time at point 1
$ ilde{ ext{T}_{ ext{m}}}$	Meter box temperature
$T_{\mathbf{s}}$	Absolute stack temperature
v	Velocity of stack gas
$\mathbf{v_n}$	Sample gas velocity in the nozzle
v <sub>min</sub>	Minimum stack velocity
v <sub>max</sub>	Minimum stack velocity  Gas volume sampled, corrected to standard conditions (SCF)
$egin{array}{c} egin{array}{c} egin{array}{c} V_{f m} \end{array}$	Dry gas volume sampled (dry gas meter data), ACF
$v_c^m$	Quantity of water captured in impingers and silica gel
Z	Ratio between estimated cyclone IV D <sub>50</sub> values
_	230 -230
<u>Greek</u>	
Symbol_	Description
ΔΗ	Meter box orifice pressure drop,
ΔΗ@	Pressure drop across orifice at flow rate of 0.75 SCFM at standard conditions, [Note: specific to each orifice and meter box]
$\Delta p_n$	Velocity pressure measured at point n during the test run
$\Delta p_1$	Velocity pressure measured at point 1 during the test run
$\Delta p_{min}$	Minimum velocity pressure within the isokinetic criteria
$\Delta p_{f max}$	Maximum velocity pressure within the isokinetic criteria
$\Delta p_{S}$	Velocity pressure adjusted for combined cyclone pitot tube
Δp <sub>m</sub>	Observed velocity pressure using S-type pitot tube in Method 2 traverse, preliminary traverse
$\Delta p_{s_1}$	Velocity pressure calculated in Equation 24
$\Delta p_{s_2}$	Velocity pressure corrected for blockage
γ	Dry gas meter gamma value
θ	Total run time
μ	Gas viscosity
<u>Other</u>	
Symbol	<u>Description</u>
%CO <sub>2</sub>	Carbon Dioxide content of gas stream
%O2	Oxygen content of gas stream

# **Acronyms**

ACFM Actual cubic feet per minute CSR Constant sampling rate

DSCFM Dry standard cubic feet per minute

DSCF Dry standard cubic feet

EPA U.S. Environmental Protection Agency

ICP Ion coupled plasma spectroscopy

PM Particulate matter

PM<sub>10</sub> Particulate matter with an aerodynamic diameter equal to or less than 10 micrometers PM<sub>2.5</sub> Particulate matter with an aerodynamic diameter equal to or less than 2.5 micrometers

SCF Standard cubic feet

SCFM Standard cubic feet per minute SRI Southern Research Institute

# MEASUREMENT OF PM<sub>10</sub> & PM<sub>2.5</sub> EMISSION FACTORS AT A STONE CRUSHING PLANT

### 1. SUMMARY

The purpose of this test program was to accurately measure PM<sub>10</sub> and PM<sub>2.5</sub> particulate emissions from a set of tertiary crushers, a fines crusher, a conveyor transfer point, and a vibrating sizing screen at a stone crushing plant. These tests were part of the National Stone Association (NSA) program initiated in 1991 to determine emission factors for the crushed stone industry. The Vulcan Materials Company Plant in Pineville, North Carolina served as the test location for the 1996 tests. This plant was selected because (1) a variety of stone processing equipment was available, (2) there was safe access to all the test locations, (3) the travel costs to the plant were low, and (4) it was conveniently accessible to representatives of the U.S. EPA and the State of North Carolina who were invited to view the tests.

These tests were sponsored by NSA and were conducted by Air Control Techniques, P.C. (ACTPC) in accordance with the test protocols developed for previous tests conducted by ACTPC for NSA on similar emission sources.

At the present time, there is not a U.S. EPA promulgated reference method for the measurement of particulate in the PM<sub>2.5</sub> size range. ACTPC used a testing technique that is a combination of Method 201A for PM<sub>10</sub> and the cascade cyclone particle sizing technique developed by EPA. This sampling system consists of the PM<sub>10</sub> cyclone from Method 201A followed by the PM<sub>2.5</sub> cyclone from a five stage cascade cyclone train. A 47mm filter is mounted after the PM<sub>2.5</sub> cyclone. The sampling train is identical to Method 201A except that the PM<sub>2.5</sub> cyclone is inserted between the PM<sub>10</sub> cyclone and the filter. For this reason, the term "modified Method 201A" used in this report is appropriate for describing the overall test method. This method was chosen since it is consistent with Reference Method 201A<sup>[1]</sup> for PM<sub>10</sub> and with an EPA test development report concerning PM<sub>2.5</sub> particulate<sup>[2]</sup>.

A conventional quasi-stack system was used to conduct emission tests on the inlets and outlets of a 7 foot shorthead tertiary crusher and a 1560 omni-cone tertiary crusher. This method has been used in previous studies to develop AP-42 emission factors. Two enclosures were built at the inlets to the tertiary crushers, and one enclosure was built around the outlet of both tertiary crushers. The enclosures were ducted together to a common sampling point where the modified Method 201A sampling train was used to measure particulate concentrations. Using this testing approach, all of the PM<sub>10</sub> emissions from the crushers inlets and outlets were captured efficiently. Adjacent ambient sources of PM<sub>10</sub> emissions did not affect the results. This is the most accurate method available for the capture and testing of fugitive particulate emissions from tertiary crushers.

A quasi-stack enclosure was used for capturing fugitive particulate emissions from the conveyor transfer point and the fines crusher. This method has been used in previous studies to develop AP-42 emission factors. In both sources, separate inlet and outlet enclosures were combined into a duct leading to the sampling location. The Modified Method 201A sampling train was used to measure the PM<sub>10</sub> and PM<sub>2.5</sub> emission rates in both sets of tests.

The vibrating sizing screen emission tests were conducted using a track-mounted hood system. This fugitive emission testing procedure is an adaptation of EPA Reference Method 5D. This method has been used in previous studies to develop AP-42 emission factors. The traversing

hood had dimensions of 2 feet by 2 feet and was mounted approximately 12 inches above the upper screen deck of the vibrating sizing screen. The small hood size and the mounting position ensured that the normal PM<sub>10</sub> particulate emissions were not significantly influenced by the fugitive emission capture system. The hood capture velocity was selected based on smoke tube qualitative observations of the fugitive dust capture characteristics. The track-mounted hood was ducted to a sampling location where the modified Method 201A sampling train was used to measure the PM<sub>10</sub> and PM<sub>2.5</sub> particulate concentrations.

The PM<sub>10</sub> and PM<sub>2.5</sub> emission factors are presented in Table 1. The PM<sub>10</sub> emission factors are based on the modified Method 201A filter catches combined with the less than PM<sub>10</sub> acetone rinses. The ambient particulate concentrations were measured using an MIE nephelometer and the concentrations have been factored out of the emission factors presented in Table 1. The ambient concentrations were less than 2% of the total observed particulate concentrations.

Table 1. PM <sub>10</sub> and PM <sub>2.5</sub> Emission Factors				
Equipment Tested	Emission Factor Size Range	Pounds of Emission per Ton of Stone Throughput		
Tertiary Crusher	≤ 2.5 Microns	0.00009		
Tertiary Crusher	≤ 10 Microns	0.00036		
Fines Crusher	≤2.5 Microns	0.00007		
Fines Crusher	≤ 10 Microns	0.00032		
Conveyor Transfer Point	≤2.5 Microns	0.000013		
Conveyor Transfer Point	≤ 10 Microns	0.000042		
Vibrating Screen	≤2.5 Microns	0.00005		
Vibrating Screen	≤ 10 Microns	0.00028		

The PM<sub>10</sub> results are very similar to those already published in AP-42. The results of the 1996 tests are compared with the present AP-42 data in Table 2. With the exception of the fines crusher, these results are similar to the AP-42 data. The differences that do exist are due primarily to normal plant-to-plant variability.

Table 2. Comparison of PM <sub>10</sub> Results with AP-42					
Source Pineville 1996 AP-42 Ratio,					
	(Present Data)/(AP-42				
Tertiary Crushers	0.00036	0.00059	0.61		
Fines Crusher	0.00032	$0.00200^{1}$	0.16		
Conveyor Transfer Point	0.000042	0.000048	0.88		
Vibrating Screen	0.00028	0.00084	0.33		

<sup>1</sup> Not a true fines crusher. This crusher was the seventh crusher in the crushing circuit but not a true fines crushing application.

# 2. SAMPLING LOCATIONS AND TESTING PROCEDURES

## 2.1 Objectives

The objective of these tests was to accurately measure PM<sub>10</sub> and PM<sub>2.5</sub> emissions from a set of tertiary crushers, a fines crusher, a conveyor transfer point, and a vibrating sizing screen at a stone crushing plant. All of these sources were controlled with conventional wet suppression techniques. The specific objectives included the following.

- Efficiently capture the PM<sub>10</sub> and PM<sub>2.5</sub> emissions entrained by the equipment being tested without significantly affecting the emission rate from the equipment.
- Determine the PM<sub>10</sub> and PM<sub>2.5</sub> emissions concentrations using modified Method 201A.
- Determine the ambient PM<sub>10</sub> and PM<sub>2.5</sub> concentrations during the three to six hour time period of the emission test.
- Calculate the equipment specific PM<sub>10</sub> and PM<sub>2.5</sub> emission factors based on measured stone throughput rates.
- Measure the moisture content, size distribution, silt content and throughput rates of the stone being handled by the specific pieces of equipment to document the representativeness of the test conditions.
- Measure the ambient temperatures, barometric pressures, and relative humidity to document the representativeness of the test conditions.
- Measure the ambient wind speed and direction during the vibrating sizing screen tests to confirm that the sampling criteria were satisfied throughout the test periods.

## 2.2 Process Description and Operation

The Vulcan Materials Company Plant in Pineville, North Carolina produces 1.5 million tons of crushed granite per year. It uses crushing, screening, and conveying equipment that is representative of the crushed stone industry in general. A flowchart of the plant process equipment is shown in Figure 1.

### **Tertiary Crushers**

The 7 foot shorthead and 1560 omni-cone tertiary crushers are located side-by-side and were tested simultaneously. The feed stream to both tertiary crushers is the oversized stone discharged from the two parallel 8 foot by 20 foot vibrating sizing screens. The crushers discharge the crushed stone onto conveyor C-4 shown in Figure 1. The stone is transferred from conveyor C-4 to conveyor C-3 and is then sent back to the vibrating sizing screens. The stone flow through this part of the Pineville plant is termed "closed circuit" because oversized material recirculates through the vibrating sizing screens and crushers until the stone is crushed small enough to fall through the vibrating sizing screen.

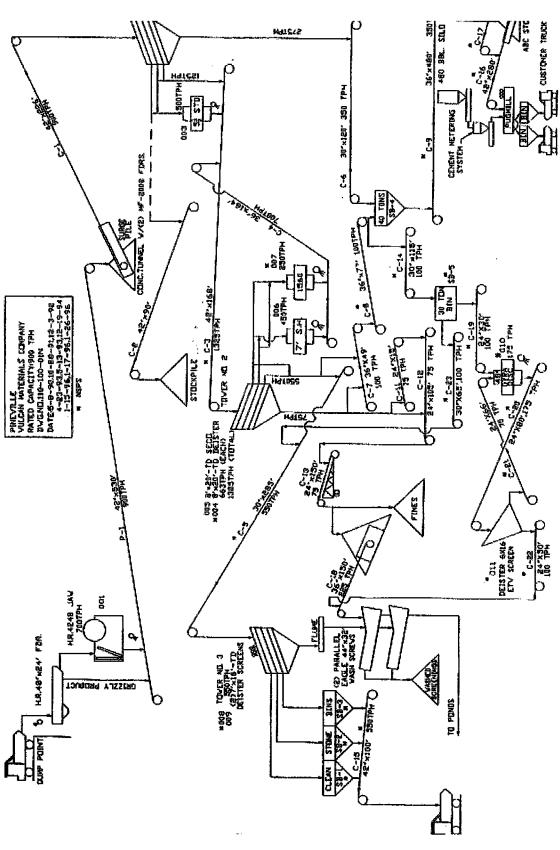


Figure 1. Pineville, Vulcan Materials Company, Process Flowchart

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### **Fines Crusher**

The 48 inch grya-disc fines crusher receives material from two conveyors shown as C-19 and C-21 in Figure 1. Conveyor C-19 handles small stone that has passed through the second deck of the dual 8 foot by 20 foot triple deck vibrating sizing screens and fine material that has passed through the third deck of the 6 foot by 16 foot triple deck vibrating sizing screen. The gyra-disc also receives the oversized stone from the 6 foot x 16 foot fines vibrating sizing screen. This oversized stone is conveyed to the fines crusher on conveyor C-21. The fines crusher discharges the crushed stone onto conveyor C-20 in Figure 1.

## **Conveyor Transfer Point**

The transfer point from conveyor C-4 to conveyor C-3 was also tested for emissions. This conveyor handles the material that has been sent to the tertiary crushers for size reduction.

### **Vibrating Sizing Screens**

There are two parallel 8 foot by 20 foot vibrating sizing screens. The screen serves the 7 foot shorthead tertiary crusher. A splitter is used to proportion the stone between the parallel vibrating sizing screens. The splitter directs 60% of the total stone flow to the vibrating sizing screen tested and the downstream shorthead crusher. The stone is fed to the vibrating sizing screens and tertiary crushers by conveyor C-3 shown in Figure 1.

# Wet Suppression Fugitive Dust Control

Wet suppression is used for fugitive dust control of the 7 foot shorthead tertiary crusher, the 1560 omni-cone tertiary crushers, the vibrating sizing screens, the conveyor transfer points, and the fines crusher. Water spray nozzles are located on (1) the outlet of both the 7 foot shorthead and 1560 omni-cone tertiary crushers, (2) the outlet of the 5 ½ foot standard secondary crusher, (3) the 6 foot by 16 foot vibrating sizing screen upstream of the secondary crusher, and (4) on the outlet of the 48 inch gyra-disc.

Not all water spray nozzles in the overall plant system are required to control fugitive dust emissions. The amount of wet suppression required to control fugitive dust emissions is dependent on the ambient temperature, relative humidity, and the composition of the material being handled. Over-wetting of the stone does not have any environmental benefits, and it can cause blinding of the lower screens or blockage of the fines discharge chute underneath the vibrating sizing screens.

# 2.3 Fugitive Emission Capture Procedures

NSA and EPA have sponsored a number of studies concerning PM<sub>10</sub> emissions from stone crushing plants.<sup>[3-10]</sup> Since 1992, NSA has tested 4 tertiary crushers, 4 vibrating sizing screens, 3 transfer points, 1 fines crusher and 1 fines vibrating sizing screen for PM<sub>10</sub> emissions (AP-42 Section 11.19.2 Crushed Stone Processing). There have also been tests conducted on three quarry haul roads and a storage pile. The PM<sub>10</sub> emissions tests performed at the Vulcan Materials Company, Pineville Plant supplement all these data. Prior to the 1996 tests at Pineville, no PM<sub>2.5</sub> data have been available in AP-42 or the general technical literature. The PM<sub>2.5</sub> emission factor data are of interest due to the November 1996 proposed changes in the particulate National Ambient Air Quality Standards.

The objective of these tests was to accurately measure PM<sub>10</sub> and PM<sub>2.5</sub> emissions from a set of tertiary crushers, a fines crusher, a conveyor transfer point, and a vibrating sizing screen. Since

there are no air pollution control devices on these units, fugitive emission capture procedures were needed. The emission capture procedures that are generally applied to fugitive dust emission sources include (1) enclosures and quasi-stack sampling, (2) roof monitor sampling, and (3) upwind-downwind profiling. ACTPC considered the criteria listed in Table 3 in selecting the emission capture procedures and designing the specific systems for the test program. Due to the physical configuration of the stone processing equipment tested at Pineville, ACTPC used the same emission capture procedures that have been used to develop the existing AP-42 database for crushed stone processing.

5	r-42 database for crushed stone processing.
	Table 3. Fugitive Emission Capture Procedure
	Selection and System Design Criteria
•	The capture system should not create higher-than-actual PM <sub>10</sub> and PM <sub>2.5</sub> emission rates due to high gas velocity conditions near the point of PM <sub>10</sub> and PM <sub>2.5</sub> particle entrainment.
	The capture system should not create a sink for PM <sub>10</sub> and PM <sub>2.5</sub> emissions.
•	The capture system should isolate the process equipment unit being tested from other adjacent sources of PM <sub>10</sub> and PM <sub>2.5</sub> emissions.
•	The capture system should not create safety hazards for the emission test crew or for plant personnel. It should not create risks to the plant process equipment.
•	The capture system should not obstruct routine access to the process equipment by plant personnel.
•	The capture system and overall test procedures should be economical, practical, and readily adaptable to other plants so that these tests can be repeated by organizations wishing to confirm or challenge the emission factor data developed in this project.

The conventional quasi-stack sampling procedure satisfied these criteria for tests of a set of tertiary crushers, fines crusher, and conveyor transfer point. The roof monitoring procedure conducted using a traversing hood satisfied these criteria for the vibrating sizing screen.

# Quasi-Stack Enclosures for the 7 Foot Shorthead and the 1560 Omni-Cone Tertiary Crushers

The inlet to the two tertiary crushers was defined as the discharge chute of the vibrating screens into the crusher vessel. The inlet area of the 7 foot shorthead crusher had a height of approximately  $1\frac{1}{2}$  feet and a diameter of approximately 7 feet. The inlet area of the 1560 omnicone crusher had a height of approximately 1 foot and a diameter of approximately 5 feet. The inlets of both crushers were enclosed with sealed metal sheeting to allow capture of the PM10 and PM2.5 emissions caused by the stone-to-stone attrition. The discharge points of both crushers is conveyor C-4 shown on Figure 1. The discharge areas of both crushers were enclosed together. The combined outlet enclosure extended 5 feet upstream and downstream of both crushers. The combined outlet enclosure measured approximately 4 feet high by 30 feet long by 5 feet wide and was constructed of sealed foam board supported on a wood frame.

The tertiary crusher inlet enclosures each had 8 inch takeoff ducts. These two 8 inch ducts were wyed together into a 12 inch duct. Photograph 1 (Appendix A) shows both inlet enclosures, the takeoff ducts, and the wye. The combined crusher outlets enclosure had a 16 inch diameter takeoff duct. The combined 12 inch diameter inlet duct was teed together with the 16 inch crusher outlet duct leading to an 18 inch diameter duct. Photograph 2 shows the combined outlet

enclosure takeoff and tee. Photograph 3 shows the 7 foot shorthead side of the combined outlet enclosure. The 18 inch diameter duct was connected to a forward curved type centrifugal blower having a capacity of approximately 2,500 ACFM. With all of the enclosures ducted into the 18 inch diameter duct, only one test location was required. The PM<sub>10</sub> and PM<sub>2.5</sub> emissions measurements for the tertiary crusher were conducted in the 18 inch diameter duct shown in Photograph 4. Air flow measurements were made in each leg of the system. Dampers were used to balance air flow. Table 4 shows the measured air flows.

Table 4. Tertiary Crusher Enclosure Specifications					
Enclosure	Volume of Enclosure, Cubic Feet	Air Flow in Enclosure Duct, ACFM	Air Changes, Number per Minute	Diameter of Enclosure Duct, Inches	Gas Velocity in Duct, Feet per Minute
Inlet of 7 Foot Shorthead	58	425	7.3	8	1,200
Inlet of 1560 Omni-cone	20	300	15.0	8	840
Combined Outlet	1200 actual (~60% solid)				
Enclosures Total System,	480	1775	3.7	16	1,260
Test Location Specifications	558	2500	4.5	18	1,440

Particulate readings were made using an MIE nephelometer to correct the observed  $PM_{10}$  and  $PM_{2.5}$  concentrations measured in the outlet duct. The ambient concentrations were subtracted from the measured test location concentrations. The ambient concentrations were consistently less than 2% of the total observed  $PM_{10}$  and  $PM_{2.5}$  concentrations.

The combined gas flow from the inlet and outlet enclosures was controlled by a Dayton Model 7C507, 18 ¼ inch diameter, ¾ horsepower blower. The average air flow rate of 2,500 ACFM was sufficient to maintain a negative pressure in all parts of the enclosures. Negative pressures were necessary to ensure that there was no loss of PM<sub>10</sub> and PM<sub>2.5</sub> emissions from the enclosures. High negative static pressures were undesirable because there could be high velocity ambient air streams entering the enclosure that would bias the test results to higher-than-actual emissions.

# "Roof" Monitoring Traversing Hood Test Procedures for Vibrating Sizing Screens The track-mounted hood system used for sampling the vibrating screen consisted of a 2 foot by 2 foot galvanized steel hood suspended 12 inches above the upper deck of the vibrating sizing screen. The position of the hood above the stone is shown in Photographs 5 and 6. This hood position was sufficiently close to the upper screen deck to ensure good emission capture but not so close that the entering air stream caused significantly greater-than-actual PM<sub>10</sub> and PM<sub>2.5</sub> emissions. ACTPC believes that there was only a slight bias to higher-than-actual particulate concentrations due to the close placement of the hood above the moving stone on the upper

screen.

A Dayton Model 7C553, 9 inch diameter, ¼ horsepower radial blade blower was used to maintain the capture velocity of the air entering the hood. This face velocity was set at 200 feet per minute based on the hood capture characteristics observed during qualitative smoke tube tests. This velocity is substantially higher than the 50 feet per minute minimum capture velocity specified for vibrating screens in the report by JACA Corporation, entitled "Control of Air Emissions from Process Operations in the Rock Crushing Industry." The traversing hood capture velocity is also substantially higher than many other types of industrial hoods.

The top area of the vibrating screen was divided into a 3 by 8 array of sampling points, each of which was 2 feet by 2 feet. The only area not sampled was the 4 foot strip across the upper inlet side of the vibrating screen where the stone feed dumps onto the top of the screen. Positioning the hood in this location was not necessary or prudent due to the constant stream of falling stone from the discharge chute (Photograph 6). Air moving downward with the stream of stone from the chute travels along the screen and was captured in the 3 by 8 sampling array.

ACTPC sized the ductwork from the hood to the sampling location for an average gas flow velocity of approximately 1,000 feet per minute. The purpose of this velocity was to ensure that there were no impaction losses of  $PM_{10}$  particles in the duct. This velocity is also sufficiently low to prevent scouring of  $PM_{10}$  particles from the surfaces of large particles inadvertently captured by the closely positioned hood. Some settling of particles substantially larger than 10 microns was anticipated due to this design velocity. However, observations after each test indicated that these losses were relatively small. The capture and measurement of particles larger than 10 microns was not intended in this test program. The emission capture system was designed specifically for  $PM_{10}$  and  $PM_{2.5}$  particles, which have negligible settling rates as indicated by their very low terminal settling velocities.

The gas stream from the hood entered a short section of 12 inch diameter flexible duct that allowed the hood to traverse the 3 by 8 array over the vibrating screen. The flex duct was connected to a rigid 12 inch duct that led to the sample location and a blower that was on the ground approximately 35 feet below. Photograph 7 shows the flexible and the rigid ductwork.

Wind speed and direction were monitored to ensure that emissions from the adjacent downwind screen (not being tested) did not bias the tests. The wind speed and direction criteria were (1) sustained wind speeds  $\leq 10$  mph, (2) gusts  $\leq 15$  mph, and (3) wind direction predominantly from the west and south. It was not necessary to interrupt the tests at any time to satisfy these criteria. Photograph 8 shows the placement of the wind speed and direction indicator. This location was chosen because there were no airflow disturbances, and the sensors were at the same elevation as the vibrating screen.

# Quasi-Stack Enclosure Testing Procedures for the Conveyor Transfer Point

Enclosures were built around the transfer point of conveyor C-4 to C-3 in Figure 1. The inlet to the transfer point conveyor C-4 had an area of 4 feet by 5 feet. This area was covered, to the maximum extent possible, with sealed foam board to allow the natural air flow induced by the stone flow to carry the PM<sub>10</sub> and PM<sub>2.5</sub> emissions to the outlet of the transfer point. The middle of the transfer point was also covered to maintain the induced air draft caused by the stone on the conveyor. The discharge point of the of the transfer point is conveyor C-3, which leads to the 8 foot by 20 foot vibrating screens. The transfer point allows oversized material to be recycled in a closed loop until it is crushed to at least the size of the top screen.

The outlet of the transfer point, having an area of approximately 1 foot by 4.5 feet, was enclosed, and a hood was built to capture PM<sub>10</sub> and PM<sub>2.5</sub> emissions. Photograph 9 shows the transfer

point hood enclosure outlet. The hood had a 12 inch diameter, eighteen foot long outlet duct that lead to the ground. Photograph 10 shows the transfer point outlet duct. This outlet duct was used as a combined sampling point for both the inlet and the outlet of the transfer point. When the outlet duct reached the ground, it turned 90° and proceeded to the blower. A Dayton Model 7C553, 9 inch diameter, ¼ horsepower radial blade blower was used to maintain the capture velocity of the air entering the hood. The face velocity was set at 200 feet per minute based on the hood capture characteristics observed during qualitative smoke tube tests. The average air flow rate of 900 ACFM was sufficient to maintain a negative pressure in all parts of the enclosures. Negative pressures were required to ensure that there was no loss of PM10 and PM2.5 emissions from the enclosures. High negative static pressures were undesirable because there could be high velocity ambient air streams entering the enclosure, which could increase emissions.

ACTPC sized the ductwork from the hood to the sampling location for an average gas flow velocity of approximately 1,000 feet per minute. This velocity was selected to minimize impaction losses of particulate matter and to avoid scouring-related generation of large particles inadvertently captured in the enclosure hoods.

# Quasi-Stack Testing Procedures for the 48 Inch Gyra Disc Fines Crusher

The inlet to the fines crusher was defined as the discharge chute of conveyors C-19 and C-21 into the crusher vessel (Figure 1). The inlet area of the 48 inch gyra-disc had a height of approximately 1 foot and a diameter of approximately 4 feet. The inlet of the fines crusher was enclosed with sealed metal sheeting to allow capture of the PM<sub>10</sub> and PM<sub>2.5</sub> emissions caused by the stone to stone attrition. The discharge point of the fines crusher is conveyor C-20 in Figure 1. The discharge of the fines crusher was enclosed. The outlet enclosure measured approximately 4 feet high by 12 feet long by 4 feet wide and was constructed of sealed foam board supported on a wood frame.

The fines crusher inlet enclosure had a 12 inch diameter takeoff duct. Photograph 11 shows the fines crusher inlet enclosure and takeoff duct. The fines crusher outlet enclosure had a 16 inch diameter takeoff duct shown in Photograph 12. The 12 inch diameter inlet duct was teed together with the 16 inch diameter fines crusher outlet duct to lead to an 18 inch duct. Photograph 13 shows the combined outlet enclosure takeoff and tee. The 18 inch diameter duct was connected to a forward curved centrifugal blower having a capacity of 2,350 ACFM. With both of the enclosures ducted into the 18 inch diameter duct, only one test location was required. The PM<sub>10</sub> and PM<sub>2.5</sub> emissions measurements for the fines crusher were conducted in the 18 inch diameter duct shown in Photograph 14. Air flow measurements were conducted in each leg of the system. Table 5 shows the measured airflow of each leg of the system.

Ambient air particulate readings were conducted using an MIE nephelometer to correct the PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in the duct. The ambient concentrations were subtracted from the measured test location concentrations. The ambient concentrations were consistently less than 2% of the total particulate concentrations.

Table 5. Fines Crusher Enclosure Specifications					
Enclosure	Volume of Enclosure, Cubic Feet	Airflow in Enclosure Duct, ACFM	Air Changes, Number per Minute	Diameter of Enclosure Duct, Inches	Gas Velocity in Duct, Feet per Minute
Inlet					
Enclosure	12.6	660	52.4	12	840
Outlet Enclosure	192 actual (30% solid) 134.4	1,690	12.6	16	1,200
Total System,					-,500
Test Location					
Specifications	147	2,350	16.0	18	1,320

The combined gas flow from the inlet and outlet enclosures was controlled by a Dayton Model 7C507, 18 ¼ inch diameter, ¾ horsepower blower. The average air flow rate of 2,350 ACFM was enough to maintain negative pressures in all parts of the enclosures. Negative pressures were required to ensure that there was no loss of PM<sub>10</sub> and PM<sub>2.5</sub> emissions from the enclosures. High negative static pressures were undesirable since there could be high velocity ambient air streams entering the enclosure, which could increase emissions.

# 2.4 PM<sub>10</sub> and PM<sub>2.5</sub> Sampling Methods and Equipment

At the present time, there is not a U.S. EPA promulgated reference method for the collection and analysis of particulate in the PM<sub>2.5</sub> size range. Accordingly, there is not an off-the-shelf procedure. ACTPC evaluated possible alternative testing techniques and recommended that the NSA tests be conducted using a method that is a combination of Method 201A for PM<sub>10</sub> and the cascade cyclone particle sizing technique previously developed by EPA. This sampling system consists of the PM<sub>10</sub> cyclone from Method 201A followed by the PM<sub>2.5</sub> cyclone from a five stage cascade cyclone train. A 47mm filter is mounted after the PM<sub>2.5</sub> cyclone. The sampling train is identical to Method 201A except that the PM<sub>2.5</sub> cyclone is inserted between the PM<sub>10</sub> cyclone and the filter. For this reason, the term "modified Method 201A" is used in this report and is appropriate for describing the overall test method. The modified Method 201A sampling equipment and procedures are discussed in detail in a 1989 report prepared by Southern Research Institute for EPA's Emission Measurement Laboratory. [2] This report is presently the only EPA published material available concerning measurement of PM<sub>2.5</sub> emissions. This method satisfied all Method 201A requirements and is most consistent with EPA reference method procedures in general.

Both cyclones and the filter are coupled closely together so that the entire sampling head shown in Figure 2 can be operated in-situ. This is important to avoid the biases in the test method caused by particle losses or particle size distribution changes in the nozzle and probes used in extractive (non in-situ) tests. The PM<sub>10</sub> cyclone in the sampling head is termed cyclone I because it is the first cyclone in the original cascade cyclone sampling train. For the same reason, the PM<sub>2.5</sub> cyclone is termed cyclone IV because it is the fourth cyclone in series in the

complete cascade cyclone train. The sampling train is operated in a manner that is consistent with U.S. EPA Reference Method 201A and other EPA particulate matter measurement methods.. The complete sampling procedures are described in reference 2 and in a set of equations shown in Appendix B. It should be noted, however, that ACTPC has modified some of the nomenclature in the equations to forms consistent with Method 201A and other EPA particulate emission testing reference methods.

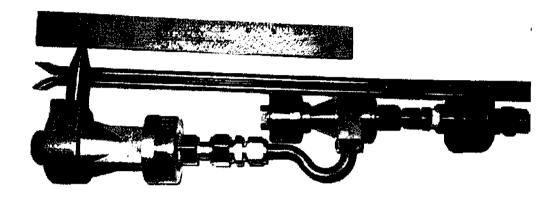


Figure 2. Modified Method 201A Sampling Head

As with Method 201A, the modified method 201A is a constant sampling rate (CSR) technique. It is critical to maintain the actual sample gas flow rate in each of the cyclones at a rate that provides the desirable particle collection efficiencies. Cyclone I must collect particles that have a D<sub>50</sub> (particle size collected with 50% efficiency) between 9 and 11.0 microns in order to be consistent with Method 201A. Cyclone IV (the second cyclone in Figure 2) should optimally have a cut diameter between 2.25 and 2.75 microns. Using the cyclone performance curves provided in reference 2 and summarized in Appendix B, ACTPC has calculated the sampling rates necessary to simultaneously satisfy the cyclone I and cyclone IV D<sub>50</sub> ranges. The area between the two solid lines in Figure 3 demonstrates that this range is reasonably large for sources operating at elevated gas temperatures. However, the acceptable operating range becomes extremely narrow at ambient temperatures such as the fugitive sources tested as part of this project. Even slight changes in air temperature can result in deviations from the desired D<sub>50</sub> range. Furthermore, it is important to maintain the sampling velocities in the nozzle at a rate that is between 80% and 120% of the isokinetic velocity.

Sample times were relatively long to ensure that catch weights of both the  $PM_{10}$  and  $PM_{2.5}$  cyclones could be analyzed gravimetrically. All sample times were based on 6 hours with the exception of run 1 on the fines crusher, which was limited to 3 hours due to approaching weather conditions. These sampling times were considerably longer than the one-hour runs typically used in EPA Methods 5 and 17 for the measurement of total filterable particulate. These long sampling times were needed due to the relatively low particulate matter concentrations in the  $PM_{2.5}$  size range.

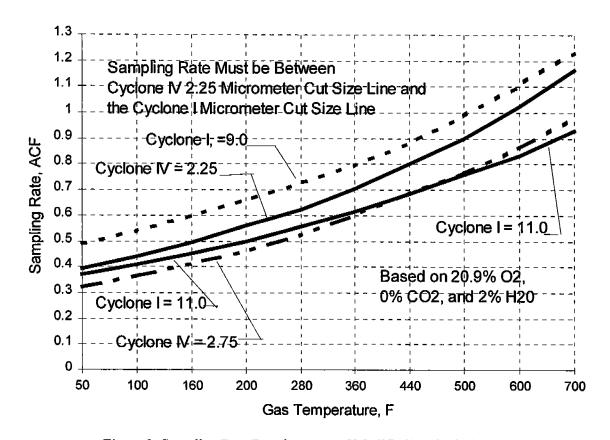


Figure 3. Sampling Rate Requirements of Modified Method 201A

# 2.5 Monitoring Process Operating Conditions

There are a number of process variables and weather conditions that could conceivably influence  $PM_{10}$  and  $PM_{2.5}$  emission rates from the equipment tested.

- Stone moisture level
- Stone size distribution
- Stone silt content
- Stone throughput rates
- Stone type
- Stone density

All of these variables, with the exception of stone type, were monitored using a combination of plant instruments, special monitoring equipment, and stone sample analyses. Stone type was not monitored because granite is the only type of stone processed at this plant.

It was also necessary to monitor the ambient particulate concentrations in the two size ranges so that the emission rates could be corrected for ambient particulate entering the enclosures and vibrating screen hoods.

# Stone Moisture Levels

Stone samples were taken during each of the emission tests. In all cases, these samples consisted of 2 linear feet long samples of stone from the conveyor serving the unit being tested. Table 6 outlines the conveyors that were used for each particular unit tested. The conveyors were stopped by plant personnel for approximately 5 minutes to permit the ACTPC test crew to remove the stone sample. The sample was placed in a sealed plastic bucket. The samples were weighed and multiplied by the conveyor speed in order to calculate a stone throughput rate in tons per hour.

Table 6. Stone Sample Conveyor Locations (Figure 1)					
Date	Corresponding Run Numbers	Sample Conveyor Number			
November 11, 1996	TP - 1 TC - 1	Conveyor C-4			
November 12, 1996	TP - 2 TC - 2	Conveyor C-4			
November 13, 1996	TP - 3 TC - 3	Conveyor C-4			
November 18, 1996	VS - 1	Conveyor C-3			
November 19, 1996	VS - 2	Conveyor C-3			
November 20, 1996	VS - 3	Conveyor C-3			
November 18, 1996	FC - 1	Conveyor C-20			
November 19, 1996	FC - 2	Conveyor C-20			
November 20, 1996	FC - 3	Conveyor C-20			

A sample was selected for analysis by placing the stone in a pile and dividing it into four quadrants. The quadrant randomly selected for analysis was further subdivided in quadrants until the sample quantity was less than approximately 8 pounds. Following the procedures outlined in Appendices C.1 and C.2 of the Fifth Edition of AP-42, the sample was weighed, dried and reweighed. The weight loss during the drying cycle was used to calculate the moisture content.

# Ambient PM<sub>10</sub> and PM<sub>2.5</sub> Particulate Levels

An MIE, Inc. nephelometer was used to monitor and provide real time data on the ambient levels of PM<sub>10</sub> and PM<sub>2.5</sub> particulate during the tests. This instrument provided a time weighted average (TWA) of ambient particulate matter concentrations in micrograms per cubic meter on a real-time basis. Measurements were taken during the all of the emission factor tests. The ambient concentrations were subtracted from the in-stack concentrations of the emission factor tests. The nephelometer readings were taken approximately 200 feet from any operating equipment to ensure that the data was representative of background ambient air concentrations.

## Stone Size Distribution and Silt Content

Samples of the stone obtained during the test (Section 2.5.1) were used to determine the size distribution and silt content. The silt content has been defined as the less than 200 mesh material. The initial sample quadrants used for moisture analysis were also used for analysis by ASTM sizing screens. The sample of approximately 8 pounds (following moisture analysis) was allowed to cool and then loaded into the ASTM sizing screens.

The following specific sizing screens were used.

- 0.375 inches (9.5 millimeters)
- 4 mesh (4.75 millimeters)
- 40 mesh (425 microns)
- 100 mesh (150 microns)
- 200 mesh (75 microns)
- 400 mesh (38 microns)

The loaded ASTM screens were placed in a RO-TAP® shaker and processed for 10 minutes. The weights of stone remaining on each of the screens were then determined by subtracting the screen tare weights from the loaded weights.

# Stone Throughput Rates

The stone processing rate for the crushers has been defined as the total volume of stone exiting the crushers and discharging on the conveyor belt. The stone processing rates for the transfer point and vibrating screens have been defined as the total volume of stone entering the transfer point and vibrating screen. The throughput rate for the vibrating screen was factored down to 60% of the total amount going to the two vibrating screens in parallel. The 60% multiplier is based on the plant setting for the splitter that controls the stone flow to the two crushers. The throughput capacity of the 7 foot shorthead crusher is greater than the throughput capacity of the 1560 Omni-cone crusher.

The stone samples (2 linear feet) taken from the conveyor were weighed. The values were multiplied by the conveyor speed in feet per minute and then divided by 2 (length of conveyor sample) to produce a pounds per minute stone throughput. This number was then multiplied by 60 minutes and divided by 2,000 pounds per ton to yield a stone throughput rate in tons per hour.

# 3.0 TEST RESULTS

# 3.1 Stone Moisture Levels

The stone moisture levels for the PM<sub>10</sub> and PM<sub>2.5</sub> emission factor tests are presented in Table 7. The moisture levels for this test were lower than previous NSA sponsored tests. Only one test was conducted when the moisture level of the stone being processed was higher than 1%.

Table 7. Stone Moisture Levels				
Date	Corresponding Run Numbers	Sample Conveyor Number	Stone Moisture Level	
November 11, 1996	TP - 1 TC - 1	Conveyor C-4	0.78%	
November 12, 1996	TP - 2 TC - 2	Conveyor C-4	1.4%	
November 13, 1996	TP - 3 TC - 3	Conveyor C-4	0.89%	
November 18, 1996	VS - 1	Conveyor C-3	0.59%	
November 19, 1996	VS - 2	Conveyor C-3	0.40%	
November 20, 1996	VS - 3	Conveyor C-3	0.47%	
November 18, 1996	FC - 1	Conveyor C-20	0.62%	
November 19, 1996	FC - 2	Conveyor C-20	0.80%	
November 20, 1996	FC - 3	Conveyor C-20	0.76%	

# 3.2 Ambient PM<sub>10</sub> and PM<sub>2.5</sub> Concentrations

The ambient  $PM_{10}$  and  $PM_{2.5}$  concentrations were monitored by an MIE Dataram nephelometer. The MIE Dataram provides a real-time and time weighted average measurement of airborne particulate concentrations. The Dataram measures mass concentrations of airborne dust, smoke, mists, and fumes and provides continuous real-time readouts. The Dataram has a wide measurement range from 0.0001 milligrams per cubic meter to 400 milligrams per cubic meter. The major advantage of the Dataram is that the results are instantaneous and can be produced immediately without laboratory gravimetric analyses of filters.

The nephelometer was used to measure time weighted averages of  $PM_{10}$  and  $PM_{2.5}$  concentrations during the emission factor tests. The ambient concentrations of  $PM_{10}$  and  $PM_{2.5}$  are presented in Table 8.

Table 8. Time Weighted Average (TWA) Ambient Particulate Concentrations								
Date	Sample	Sample	Corresponding	PM <sub>2.5</sub>	PM <sub>10</sub>			
	Start Time	Stop Time	Run Numbers	Particulate	Particulate			
				Concentration,	Concentration,			
				micrograms/	micrograms/			
				cubic meter	cubic meter			
November 11, 1996	10:38	11:38	TP - 1, TC - 1	N/A	54.5			
November 11, 1996	11:39	12:45	TP - 1, TC - 1	22.2	N/A			
November 12, 1996	10:15	11:21	TP - 2, TC - 2	N/A	21.1			
November 12, 1996	11:27	13:10	TP - 2, TC - 2	13.6	N/A			
November 13, 1996	08:07	10:10	TP - 3, TC - 3	N/A	34.2			
November 13, 1996	10:13	12:35	TP - 3, TC - 3	28.5	N/A			
November 18, 1996	09:23	10:14	VS - 1, FC - 1	N/A	197.3 l			
November 18, 1996	07:55	09:20	VS - 1, FC - 1	92.9 l	N/A			
November 19, 1996	09:00	10:20	VS - 2, FC - 2	N/A	35.2			
November 19, 1996	10:23	11:41	VS - 2, FC - 2	22.9	N/A			
November 20, 1996	08:30	09:36	VS - 3, FC - 3	N/A	58.3			
November 20, 1996	09:38	11:27	VS - 3, FC - 3	42.7	N/A			

<sup>&</sup>lt;sup>1</sup> Note, Hazy day.

# 3.3 Stone Throughput Rates

The stone throughput rates were calculated for each processing unit using the formula discussed in Section 2.5.4 of this report. The total stone throughput rate of the vibrating screens was multiplied by 60% based on the plant-set feed rates to each screen and the capacity of the 7 foot shorthead and 1560 omni-cone crushers. The calculated stone throughput rates for the vibrating screen and the 7 foot shorthead tertiary crusher are presented in Table 9.

Table 9. Stone Throughput Rates							
Date	Corresponding	Sample Conveyor	Stone Throughput Level,				
	Run Numbers	Number	Tons/Hour				
November 11, 1996	TP - 1	Conveyor C-4	952.1				
	TC - 1		1				
November 12, 1996	TP - 2	Conveyor C-4	889.0				
	TC - 2						
November 13, 1996	TP - 3	Conveyor C-4	1,034.9				
	TC - 3						
November 18, 1996	VS - 1	Conveyor C-3	907.3				
November 19, 1996	VS - 2	Conveyor C-3	906.3				
November 20, 1996	VS - 3	Conveyor C-3	1,123.3				
November 18, 1996	FC - 1	Conveyor C-20	249.5				
November 19, 1996	FC - 2	Conveyor C-20	254.5				
November 20, 1996	FC - 3	Conveyor C-20	252.4				

# 3.4 PM<sub>10</sub> AND PM<sub>2.5</sub> Emission Factors

The PM<sub>10</sub> and PM<sub>2.5</sub> emission factors were calculated in accordance with the procedures illustrated in the example calculation in Appendix C. The particulate captured on the filter and in the PM<sub>2.5</sub> cyclone outlet tube was weighed and added to yield a total PM<sub>2.5</sub> capture weight. The PM<sub>2.5</sub> capture weight was added to the particulate captured in the PM<sub>10</sub> cyclone outlet tube and the PM<sub>2.5</sub> cyclone catch cup to supply the PM<sub>10</sub> capture weight. These two separate capture weights were divided by the dry standard cubic feet of gas sampled to determine the concentration of PM<sub>10</sub> and PM<sub>2.5</sub> particulate matter in the gas sampled.

The PM<sub>10</sub> and PM<sub>2.5</sub> emissions from the vibrating screen were determined by multiplying the PM<sub>10</sub> and PM<sub>2.5</sub> particulate concentrations measured in the hood-blower system by 24 separate sampling points.

The data are expressed in pounds of  $PM_{10}$  and  $PM_{2.5}$  per ton of stone throughput. The measured  $PM_{10}$  and  $PM_{2.5}$  emission factors are presented in Table 10. The low emission factors are consistent with general observations and photographs taken during the test. There were no visible fugitive dust emissions during the tests.

	Table 10. PM <sub>10</sub> and PM <sub>2.5</sub> Emission Factors							
Equipment	Tertiary Crusher		Fines Crusher		Conveyor Transfer Point		Vibrating Screen	
Emission Factor Size Range	PM <sub>10</sub> lb/ton	PM <sub>2.5</sub> lb/ton	PM <sub>10</sub> lb/ton	PM <sub>2.5</sub> lb/ton	PM <sub>10</sub> PM <sub>2.5</sub> lb/ton		PM <sub>10</sub> lb/ton	PM <sub>2.5</sub> lb/ton
Run # 1	0.00044	0.00009	0.00041	0.00009	0.000052	0.000015	0.00020	0.00004
Run # 2	0.00036	0.00011	0.00033	0.00008	0.000043	0.000013	0.00043	0.00008
Run # 3	0.00028	0.00009	0.00020	0.00005	0.000032	0.000009	0.00020	0.00004
3 Run Average	0.00036	0.00009	0.00032	0.00007	0.000042	0.000013	0.00028	0.00005

The PM<sub>10</sub> emission factors are very close to those measured in previous tests with the exception of the fines crusher data. ACTPC believes that the differences in the data for the fines crushers are due to extremely small particle sizes at the previously tested fines crusher.

The PM<sub>10</sub> and PM<sub>2.5</sub> emissions should be relatively low since very high energy levels are needed to cause stone attrition to the less than 10 micron range. Therefore, it is unlikely that the stone processing equipment is creating substantial quantities of PM<sub>10</sub> and PM<sub>2.5</sub> particulate. This is also indicated in the size distribution and silt analysis conducted by ACTPC using dried stone. These size distribution and silt content data are presented in Table 11. The stone analyses show near negligible levels of dust in the less than 200 mesh (75 micron) or silt size range.

			Table 11	Partiala Ci	no Died-it		- <u>-</u>		
Table 11. Particle Size Distributions, Percentages Greater than Sieve Size							# %		
Sieve Size	TP - 1	TP - 2	TP - 3	FC-1	FC-2	FC-3	VS-1	VS-2	VS-3
<u> </u>	TC - 1	TC - 2	TC - 3						'~-
9.5	65.6%	59.97%	63.11%	48.83%	46.64%	39.50%	81.19%	89.88%	82.67%
Millimeters	1 2 2 2				Ĺ	İ		11.00,0	02.0770
4.75	12.6%	14.24%	14.72%	23.02%	23.09%	27.91%	7.99%	4.65%	7.32%
Millimeters								,,,,,,	,
(4 Mesh)	1 4 00 4				<u> </u>				
425 Microns	14.9%	17.94%	13.84%	20.93%	22.66%	24.71%	6.71%	2.93%	5.78%
(40 Mesh)	0.504								31,0,0
150 Microns	2.7%	3.04%	3.12%	2.53%	2.70%	2.81%	1.25%	0.79%	1.49%
(100 Mesh)	1 00 (								2112,70
75 Microns	1.8%	2.25%	2.61%	1.98%	2.27%	2.19%	1.19%	0.75%	1.31%
(200 Mesh)	1.10								1
38 Microns	1.1%	1.44%	1.45%	1.42%	1.47%	1.63%	1.09%	0.53%	0.85%
(400 Mesh)	1.10/								1
< 38 Microns	1.1%	1.11%	1.14%	1.29%	1.16%	1.23%	0.58%	0.47%	0.58%
% Silt,	2.2%	2.55%	2.59%	2.71%	2.63%	2.86%	1.67%	1.00%	1.43%
(Less than	ļ	1		}		ĺ		1.00/0	1.7570
200 Mesh)					1	ĺ			

# 4. QUALITY ASSURANCE/QUALITY CONTROL

# 4.1 Temperature, Moistures, Barometric Pressure, Wind Speed, and Wind Direction

Ambient moisture was determined using the wet bulb-dry bulb technique. A sling psychrometer was used for determining the ambient temperature and relative humidity. The sling psychrometer uses two mercury in glass thermometers. The barometric pressure was monitored using a barometer that was checked daily with the Charlotte, NC Airport. The wind speed and direction were monitored using a MAXIMUM<sup>TM</sup> wind speed and direction instrument.

# 4.2 Dry Gas Meter Calibration

All dry gas meters were fully calibrated to determine the volume correction factor prior to field use. Post-test calibration checks were performed as soon as possible after the equipment was returned to the shop. Pre- and post-test calibrations agreed within  $\pm$  5 percent. The calibration procedure is documented in Section 3.3.2 of EPA Publication No. 600/4-77-237b.

# 4.3 Particulate Sampling QC Procedures

Sampling QC procedures included the following.

- Properly prepared glassware was used for recovering samples.
- All sampling nozzles were manufactured and calibrated according to EPA standards.
- Filters were weighed, handled, and stored in a manner to prevent contamination.
- Recovery procedures were completed in a clean environment.

# 4.4 Sample Volume, D<sub>50</sub> Values, and Percent Isokinetics

All sample runs met the results acceptability criteria as defined by Section 6.3.5 of Method 201A. The isokinetic rates were within ±20 percent. A summary of the sampling rates and percent isokinetics for the modified Method 201A tests is presented in Table 12.

Table 12. Average Isokinetic, D <sub>50</sub> s, and ΔH Values							
Run	Isokinetics,	Cyclone I	Cyclone IV	ΔH (Avg),			
Number	(%)	D <sub>50</sub> , Microns	D <sub>50</sub> , Microns	In. W.C.			
TC-1	95.2	10.83	2.28	0.49			
TC-2	90.5	10.87	2.29	0.48			
TC-3	93.4	10.84	2.29	0.48			
FC-1	97.6	10.56	2.21	0.48			
FC-2	97.3	10.60	2.23	0.48			
FC-3	103.3	10.63	2.24	0.47			
TP-1	92.8	10.21	2.08	0.56			
TP-2	86.8	10.47	2.15	0.55			
TP-3	89.8	10.44	2.14	0.55			
VS-1	98.5	10.61	2.22	0.51			
VS-2	98.6	10.53	2.21	0.50			
VS-3	103.9	10.66	2.25	0.50			

All of the isokinetic results are consistent with Method 201A criteria of 80% to 120%. The  $PM_{10}$  (cyclone I)  $D_{50}$  values are also consistent with the Method 201A requirement of  $D_{50}$  values equal to or greater than 9.0 microns and equal to or less than 11.0 microns. Because all of the  $D_{50}$  values in this test program are greater than 10 microns, some particles with aerodynamic diameters greater than 10 microns were included in the  $PM_{10}$  catch. This means that there is a slight bias to larger-than-actual  $PM_{10}$  emissions.

Some of the  $PM_{2.5}$  (cyclone IV)  $D_{50}$  values were slightly below the desirable range of 2.25 to 2.75 microns. This occurred due to the very narrow acceptable sampling rate range for ambient sources shown in Figure 3. Adjustment of the sampling rate by even 0.01 ACFM to allow higher cyclone IV  $D_{50}$  values might have caused out-of-specification cyclone I  $D_{50}$  values. The sampling rates used in the tests were considered the best operating range for both cyclones together. The slightly low cyclone IV  $D_{50}$  values indicates that the  $PM_{2.5}$  emission rates are biased slightly lower-than-actual.

# 4.5 Temperature Measuring Device Calibration and Type S Pitot Tube Calibration

Reference mercury in glass stem thermometers were used to verify all temperature readings. They were calibrated using the procedure described in Section 3.4.2 of EPA Document 600/4-77-027b.

EPA has specific guidelines concerning the construction and geometry of an acceptable S-type pitot tube. If the specified guidelines are met, a pitot tube coefficient of 0.84 is used. Information pertaining to S-type pitot tubes is presented in detail in Section 3.1.1 of EPA Publication No. 600/4-77-027b. Only S-type pitot tubes meeting the required EPA specifications were used in this project.

### 4.6 Data Validation

All data and/or calculations for flow rates and emission rates were made using computer software and were validated by an independent check. All calculations were spot checked for accuracy and completeness. In general, all measurement data were validated based on the following criteria.

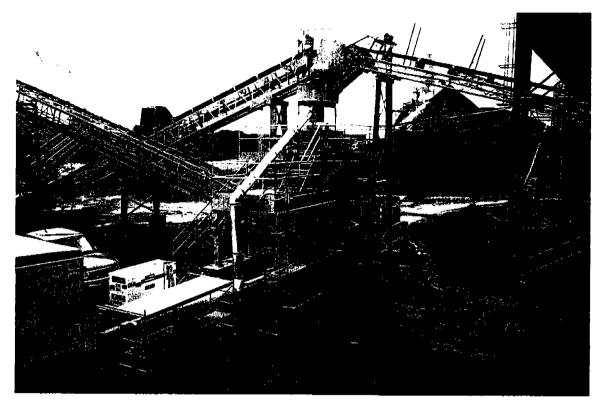
- Process conditions were representative during sampling or testing.
- Acceptable sample collection procedures were confirmed by determination of actual D<sub>50</sub> values for both cyclones and acceptable isokinetic levels as required by Method 201A.
- Testing adhered to prescribed QC procedures.

# 5.0 REFERENCES

- 1. U.S. EPA. Method 201A. 40 CFR, Part 60, Appendix A.
- Dawes, S.S., and W.E. Farthing. "Application Guide for Measurement of PM2.5 at Stationary Sources." Southern Research Institute draft report numbered SRI-ENV-88-198. Prepared in accordance with EPA Contract 68-020-4442 and submitted to Mr. Thomas E. Ward, U.S. EPA Monitoring Systems Laboratory. Undated.
- 3. Richards, J., T. Brozell, and W. Kirk, <u>PM-10 Emissions from a Tertiary Crusher.</u> U.S. EPA Contract 68-D1-0055. January 1992.
- 4. Kirk, W., T. Brozell, and J. Richards, <u>PM-10 Emissions from a Tertiary Crusher and a Tertiary Screen.</u> U.S. EPA Contract 68-D1-0055. October 1992.
- 5. Brozell, T., J. Richards, and W. Kirk, <u>PM-10 Emissions from a Tertiary Crusher and a Tertiary Screen</u>. National Stone Association Contract. December 1992.
- 6. Brozell, T., J. Richards, and W. Kirk, <u>PM-10 Emissions from a Conveyor Transfer Point.</u> U.S. EPA Contract 68-D1-0055. February 1993.
- 7. Brozell, T., and J. Richards, <u>PM-10 Emissions from a Tertiary Crusher and a Tertiary Screen.</u> U.S. Environmental Protection Agency. May 1993.
- 8. Brozell, T., and J. Richards, <u>PM-10 Emissions from a Tertiary Crusher and a Tertiary Screen</u> U.S. Environmental Protection Agency. May 1993.
- Richards, J.R. and T. Brozell, <u>PM10 Emission Factors for Sloped, Vibrating Screens and Tertiary Crushers at Five Stone Crushing Plants.</u> Paper presented at the National Stone Association Annual Meeting Concerning Health, Safety, and Environment, Atlanta, Georgia. November 1993.
- 10. Brozell, T., <u>PM-10 Emissions from Two Transfer Points at a Granite Stone Crushing Plant.</u> U.S. EPA Contract 68-D1-0055. January 1994.
- 11. Frankel, R., <u>A Review of Methods for Measuring PM-10 Emission Rates from Stationary Sources</u>. Report submitted to the EPA Emissions Measurement Laboratory. Undated.

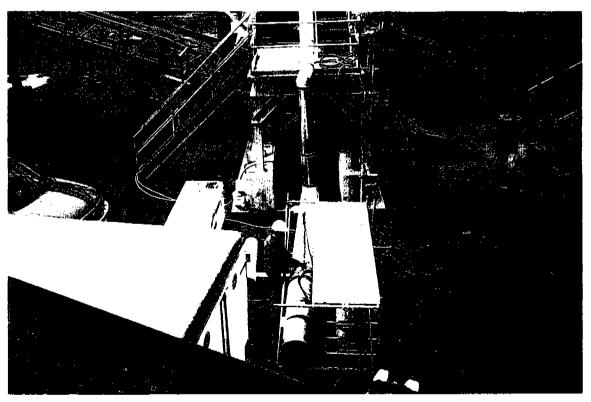
# APPENDIX A.

# PHOTOGRAPHS OF TEST LOCATIONS

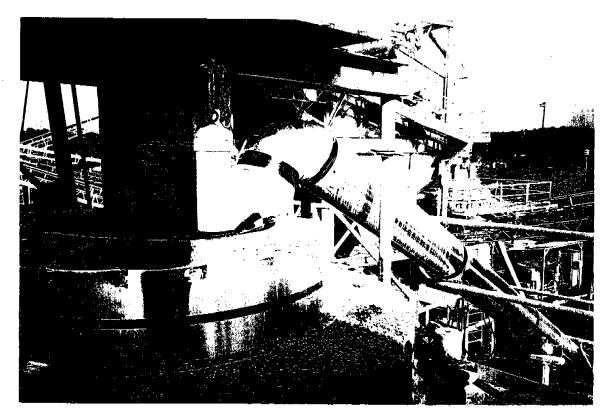


Photograph 13. Fines Crusher 12 Inch Inlet Duct Coming Down to Tee (upper part of photograph)

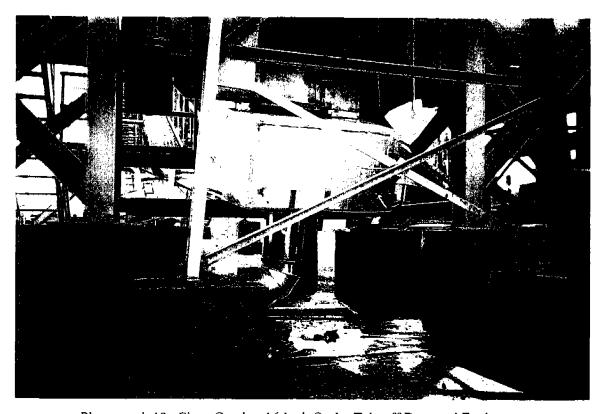
Blower and Test Location (lower part of photograph)



Photograph 14. Fines Crusher 16 Inch Outlet Takeoff Duct (under platform)
Teed to 12 Inch Inlet Duct, Increased to 18 Inch Sample Duct



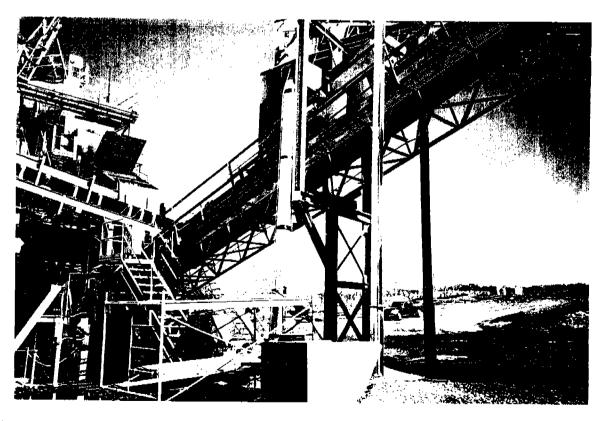
Photograph 11. Fines Crusher Inlet Enclosure with 12 Inch Takeoff Duct Coming Down



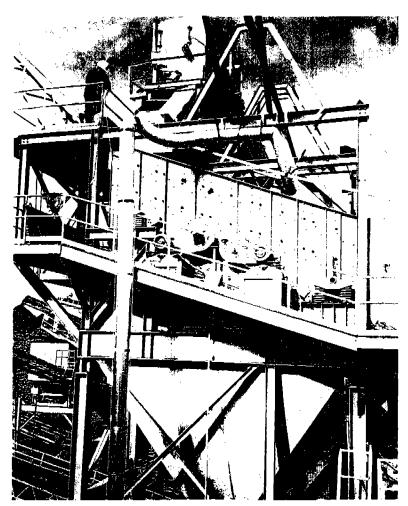
Photograph 12. Fines Crusher 16 Inch Outlet Takeoff Duct and Enclosure



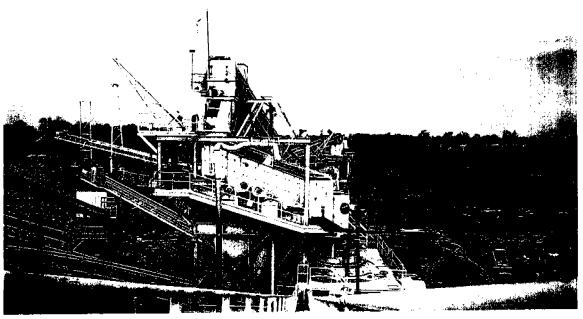
Photograph 9. Transfer Point Combined Inlet and Outlet Enclosure Hood with 12 Inch Takeoff Duct



Photograph 10. Transfer Point 12 Inch Outlet Duct Proceeding to Sample Location and Blower Below



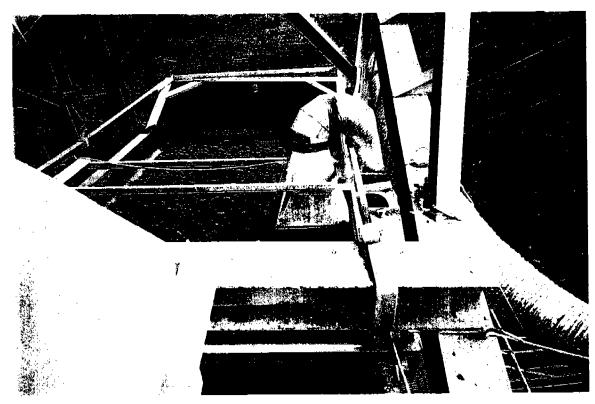
Photograph 7. Vibrating Screen, Flexible Takeoff Duct Connected to Rigid Outlet Duct Proceeding to Sample Location and Blower Below



Photograph 8. Vibrating Screen, Wind Speed and Direction Indicator in Foreground,
Traversing Track-Mounted Hood System in Background



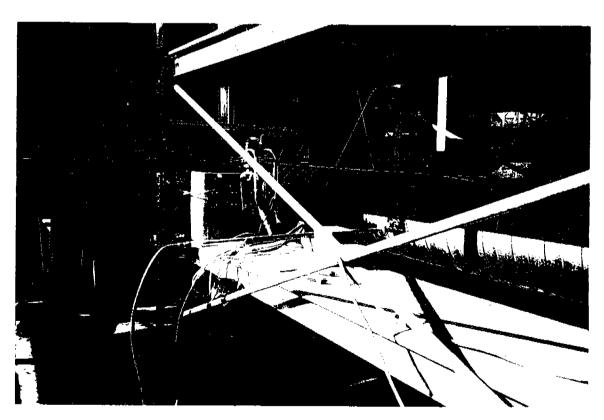
Photograph 5. Vibrating Screen, Track-Mounted Hood System with Flexible Duct Takeoff to Allow Traversing of the Hood System



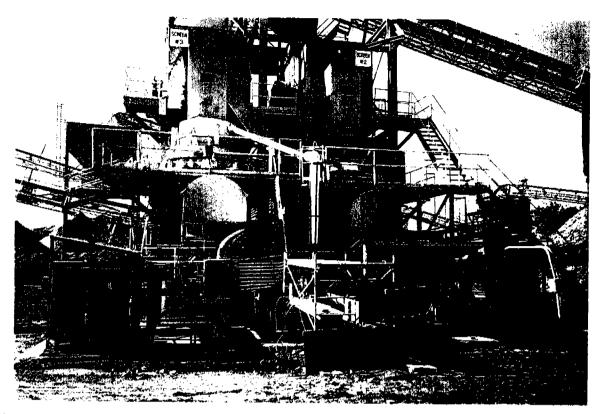
Photograph 6. Vibrating Screen, Track-Mounted Hood System, Structural Steel I Beam and Stone Flow Prevent Sampling in Upper 4 Feet of Vibrating Screen



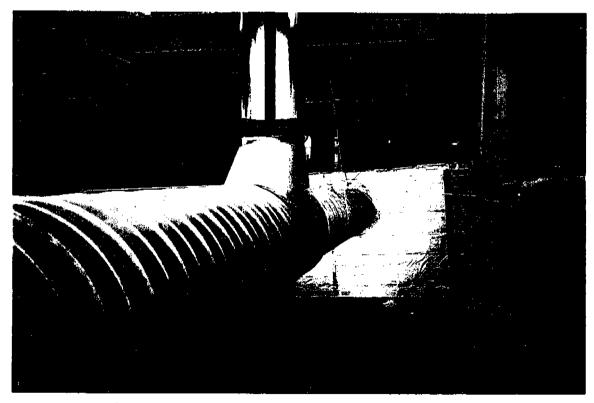
Photograph 3. Tertiary Crusher, South Side of Outlet Enclosure



Photograph 4. Tertiary Crusher 18 Inch Sample Duct Tee and Outlet Enclosure can be seen in the Background.



Photograph 1. Tertiary Crusher Inlets Wyed Together with Common 12 Inch Duct Coming Down to Tee (upper part of photograph) Blower and Test Location (lower part of photograph)



Photograph 2. Tertiary Crusher 16 Inch Outlet Takeoff Duct Teed to 12 Inch Common Inlet Duct, Increased to 18 Inch Sample Duct

### APPENDIX B.

# $PM_{10} \ AND \ PM_{2.5} \ TEST \ CALCULATIONS$

### Step 1. Select sampling location and port sizes.

### Step 2. Preliminary Measurements

$$\mu = C_1 + C_2 T_s + C_3 T_s^2 + C_4 (\%O_2) - C_5 B_{ws}$$

Equation 1

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(100 - \%O_2 - \%CO_2)$$

Equation 2

$$M_w = M_d(1 - B_{ws}) + 18(B_{ws})$$

Equation 3

Calculations are based on data obtained during the preliminary measurements.

### Step 3. Determine the sample gas flow rate.

$$C = 1 + 0.0057193 \left[ \frac{\mu}{P_s D_{50}} \right] \left[ \frac{T_s}{M_w} \right]^{0.5}$$

Equation 7

$$D_{50}_{LL} = 9.507C^{0.3007} \left[ \frac{M_w^P_s}{T_s} \right]^{0.1993}$$

Equation 9 ( $N_{re} < 3162$ )

$$D_{50} = \left(\frac{11 + D_{50LL}}{2}\right)$$

Equation 10

All calculations in this step use data obtained during the preliminary traverse.

### Step 3. Determine the sample gas flow rate (continued).

$$Q_{s} = Q_{I} = 0.07296(\mu) \left[ \frac{T_{s}}{M_{w}P_{s}} \right]^{0.2949} \left[ \frac{1}{D_{50}} \right]^{1.4102}$$
 Equation 4

$$N_{re} = 8.64 \times 10^{5} \left[ \frac{P_{s} M_{w}}{T_{s}} \right] \left[ \frac{Q_{s}}{\mu} \right]$$
 Equation 8

If Nre > 3162, then recalculate the D $_{50LL}$  using Equation 11. Calculate the D $_{50}$  target value. If Nre < 3162 go directly to Point A.

$$D_{50}_{LL} = 10.0959C^{0.4400} \left[ \frac{M_w P_s}{T_s} \right]^{0.0600}$$
 Equation 11 (N<sub>re</sub>  $\ge$  3162)

$$D_{50} = \left(\frac{11 + D_{50LL}}{2}\right)$$
 Equation 10

Use value of  $D_{50LL}$  determined in Equation 11., recalculate the sample flow rate in cyclone I using the  $D_{50}$  from Equation 10.

$$Q_{s} = Q_{I} = 0.07296(\mu) \left[ \frac{T_{s}}{M_{w}P_{s}} \right]^{0.2949} \left[ \frac{1}{D_{50}} \right]^{1.4102}$$
 Equation 4

Recheck the Reynolds Number using Equation 8 to confirm that it is equal to or greater than 3162.

### Step 3. Determine the sample gas flow rate (continued).

### **POINT** A

$$\Delta H = \left[ \frac{Q_s (1 - B_{ws}) P_s}{T_s} \right]^2 \left[ \frac{1.083 T_m M_d \Delta H@}{P_{bar}} \right]$$
 Equation 12

Determine the orifice pressure drop using the sample gas flow rate, Q<sub>s</sub>, from the preliminary traverse and measured (or estimated) stack data obtained during the preliminary traverse.

Calculate orifice pressure drops( $\Delta H$ ) at  $\pm 50^{\circ}F$  of the observed stack temperature during the preliminary traverse. These data are used if there is a significant change in the gas temperature during the test.

### Step 3. Select Nozzle(s)

### POINT B

$$v_n = \frac{3.056Q_s}{D^2}$$

Qs is obtained from Equation 4. The diameter, D, of the nozzle believed to be most appropriate is used in Equation 13. The next set of steps are a trial-and-error process for selecting the nozzle that will allow isokinetic sampling.

Equation 13

$$R_{\min} = \left[ 0.2457 + \left( 0.3072 - \frac{0.2603(\mu)(Q_s)^{0.5}}{v_n^{1.5}} \right)^{0.5} \right]$$
Equation 14
$$R_{\max} = \left[ 0.4457 + \left( 0.5690 + \frac{0.2603(\mu)(Q_s)^{0.5}}{v_n^{1.5}} \right)^{0.5} \right]$$
Equation 15

If  $R_{min}$  is an imaginary number (value under square root function is negative) or if  $R_{min}$  is less than 0.5, then the minimum velocity is calculated as shown in Equation 16. If  $R_{min}$  is a real value greater than 0.5, then the minimum velocity is calculated using Equation 17.

$$v_{\min} = v_n(0.5)$$
 Equation 16  
 $v_{\min} = v_n R_{\min}$  Equation 17

Equation 18 should be used to calculate the maximum stack velocity if the  $R_{max}$  value is greater than 1.5. If  $R_{max}$  is equal to or less than 1.5, Equation 19 should be used to calculate the maximum stack velocity.

$$v_{max} = v_n (1.5)$$
 Equation 18  
 $v_{max} = v_n R_{max}$  Equation 19

$$\Delta p_{\min} = 1.3686 \times 10^{-4} \left[ \frac{P_s M_w}{T_s} \right] \left[ \frac{v_{\min}}{C_p} \right]^2$$

$$\Delta p_{\max} = 1.3686 \times 10^{-4} \left[ \frac{P_s M_w}{T_s} \right] \left[ \frac{v_{\max}}{C_p} \right]^2$$
Equation 21

Compare the velocity pressure minimum and maximums calculated in Equations 16 and 17. If these completely bracket the velocity pressure drop measurements during the preliminary traverse, go to Point C. If some of the velocity pressure drops are outside the calculated minimum and maximum values, return to Point B and select another nozzle diameter. Repeat this trial-and-error process as many times as necessary

### POINT C

### Step 4. Assemble the combined cyclone sampling head and leak check the entire train.

This is the only time that the combined cyclone sampling head is leak checked.

### Step 5. Conduct the test.

$$t_1 = \left[\frac{\sqrt{\Delta p_1}}{\left(\sqrt{\Delta p}\right)_{avg}}\right] \left[\frac{t_r}{N}\right]$$

Equation 22

$$t_n = t_1 \frac{\sqrt{\Delta p_n}}{\sqrt{\Delta p_1}}$$

Equation 23

$$\Delta p_{s} = \Delta p_{m} \left[ \frac{C_{p}}{C_{p}} \right]^{2}$$

Equation 24

The velocity pressure correction shown in this equation is used only if the pitot tube used with the combined cyclone sampling head has a different coefficient that the pitot tube used during the preliminary traverse.

$$b_f = (12.0/A)$$

Equation 25

$$\Delta p_{s_2} = \Delta p_{s_1} \left[ \frac{1}{\left( 1 - b_f \right)} \right]^2$$

Equation 26

The velocity pressure correction provided by Equation 26 is needed only when the duct or stack being tested has a diameter less than 24 inches. This correction term should not be used on stacks less than 18 inches diameter being tested by extractive sampling techniques.

Do not leak check the combined cyclone sampling head and train during port changes.

### Step 6. Document the process and air pollution control device operating conditions.

# Step 7 - Remove the combined cyclone head after the test and leak check the remainder of the sampling system.

Remove the combined cyclone sampling head before leaking checking the remainder of the sampling train.

# Step 8 - Recover the particulate in the > 10 micrometers, $\leq$ 10 and > 2.5 micrometers, and $\leq$ 2.5 micrometers size ranges.

Disiccate and weigh the samples in each size category. Determine the solids catch weights in the following size ranges

- >10 micrometer size range (M1, sample jar #1)
- ≥ 10 micrometers and >2.5 micrometers size range (M2, sample jar #2)
- ≤ 2.5 micrometer size range (M3 and M4, sample jars #3 and #4)

### Step 9. Calculate the actual test conditions.

$$V_{ms} = \left[\frac{528}{29.92}\right] \left[\gamma V_{m}\right] \left[\frac{\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_{m}}\right]$$

Equation 27

$$Q_{s_{ST}} = \frac{v_{ms}}{\theta}$$

Equation 28

$$V_{ws} = 0.04707 V_c$$

Equation 29

$$B_{ws} = \left[ \frac{V_{ws}}{V_{ms} + V_{ws}} \right]$$

Equation 30

The data used in all of these equations is obtained during the test run.

$$Q_{s} = \frac{29.92}{528} Q_{s_{ST}} \left[ \frac{1}{(1 - B_{ws})} \left[ \frac{T_{s}}{P_{s}} \right] \right]$$

Equation 31

$$\mu = C_1 + C_2 T_s + C_3 T_s^2 + C_4 (\%O_2) - C_5 B_{ws}$$

Equation 1

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(100 - \%O_2 - \%CO_2)$$

Equation 2

$$M_w = M_d (1 - B_{ws}) + 18(B_{ws})$$

Equation 3

$$N_{re} = 8.64 \times 10^5 \left[ \frac{P_s M_w}{T_s} \right] \left[ \frac{Q_s}{\mu} \right]$$

Equation 8

### Step 9. Calculate the actual test conditions.

Determine the cut diameter of cyclone I based on actual conditions.

$$D_{50} = 0.15625 \left[ \frac{T_s}{M_w P_s} \right]^{0.2091} \left[ \frac{\mu}{Q_s} \right]^{0.7091}$$
 Equation 32

# Step 9. Calculate the actual test conditions. Determine the cut diameter of cyclone IV at actual conditions.

Note: this is a trial-and-error iterative solution. This is needed since the Cunningham correction factor is a function of the particle diameter, and the cut diameter is a function of the Cunningham correction factor.

$$C = 1 + 0.0057193 \left[ \frac{\mu}{P_s D_{50}} \right] \left[ \frac{T_s}{M_w} \right]^{0.5}$$
 Equation 7

$$D_{50} = 0.0024302 \left[ \frac{\mu}{Q_s} \right]^{1.1791} \left[ \frac{1}{C} \right]^{0.5} \left[ \frac{T_s}{P_s M_w} \right]^{0.6790}$$
 Equation 33 (N<sub>re</sub><3162)

$$D_{50} = 0.019723 \left[ \frac{\mu}{Q_s} \right]^{0.8058} \left[ \frac{1}{C} \right]^{0.5} \left[ \frac{T_s}{P_s M_w} \right]^{0.3058}$$
 Equation 34 (N<sub>re</sub>≥ 3162)

### POINT D

$$C_1 = 1 + 0.0057193 \left[ \frac{\mu}{P_S D_{50}} \right] \left[ \frac{T_S}{M_W} \right]^{0.5}$$
 Equation 35

$$D_{50_1} = 0.0024302 \left[ \frac{\mu}{Q_s} \right]^{1.1791} \left[ \frac{1}{C_1} \right]^{0.5} \left[ \frac{T_s}{P_s M_w} \right]^{0.6790}$$

Equation 36 (N<sub>re</sub><3162)

$$D_{50_{1}} = 0.019723 \left[ \frac{\mu}{Q_{s}} \right]^{0.8058} \left[ \frac{1}{C_{1}} \right]^{0.5} \left[ \frac{T_{s}}{P_{s}M_{w}} \right]^{0.3058}$$
 Equation 37 (N<sub>re</sub> ≥3162)

$$Z = \frac{D_{50}}{D_{50}}$$
 Equation 38

If Z is equal to or greater than 0.99 and less than or equal to 1.01, then continue on to point E. If Z is outside this range, go back to point D and modify C1 slightly. Continue this iterative process until the Z value is between 0.99 and 1.01.

Step 9. Calculate the actual test conditions. Determine the average stack velocity.

### POINT E

$$v = K_p C_p \left( \sqrt{(\Delta p)} \right)_{avg} \left[ \sqrt{\frac{T_s}{P_s M_w}} \right]$$

Equation 40

The isokinetic ratio is calculated using equation 35. This ratio must be between 80% and 120%.

$$I = \left(\frac{100T_{s}V_{ms}^{29.92}}{60v\theta A_{n}P_{s}(1-B_{ws})528}\right)$$

Equation 41

$$C_{total} = \left(\frac{7000}{453,592}\right) \left[\frac{M_1 + M_2 + M_3 + M_4}{V_{ms}}\right]$$

Equation 42

$$C_{PM_{10}} = \left(\frac{7000}{453,592}\right) \left[\frac{M_2 + M_3 + M_4}{V_{ms}}\right]$$

Equation 43

$$C_{PM_{2.5}} = \left(\frac{7000}{453,592}\right) \left[\frac{M_3 + M_4}{V_{ms}}\right]$$

**Equation 44** 

# APPENDIX C. EXAMPLE EMISSION FACTOR CALCULATIONS

### **EXAMPLE CALCULATIONS**

Run Number: VS - 1

### Stack Gas Temperature, R

$$T_s = 460 + ts$$

$$T_s = 460 + 51.6 = 511.6$$

### Volume of Dry Gas Sampled at Standard Conditions, Dry Standard Cubic Feet

$$V_{mstd} = [17.64] \left[ \gamma V_{m} \right] \frac{\left( P_{bar} + \frac{\Delta H}{13.6} \right)}{T_{m}}$$

$$V_{\text{mstd}} = [17.64][1.004][138.954] \boxed{\frac{\left(29.50 + \frac{0.51}{13.6}\right)}{70.6}}$$

$$V_{mstd} = 136.997$$

### Sample Gas Flow Rate, DSCFM

$$Q_{sST} = \frac{V_{mstd}}{\theta}$$

$$Q_{sST} = \frac{136.997}{356.0}$$

$$Q_{\rm sST} = 0.396$$

### Volume of Water Sampled, SCF

$$V_{wstd} = 0.04707[Vlc]$$

$$V_{wstd} = 0.04707[38.34]$$

$$V_{wstd} = 1.805$$

### Fraction of Water Vapor in Sample Gas Stream

$$\%H_20 = \left[\frac{V_{wstd}}{V_{mstd} + V_{wstd}}\right]$$

$$\%$$
 H<sub>2</sub>0 =  $\left[\frac{1.805}{136.997 + 1.805}\right]$ 

$$%H_20 = 1.3$$

### Sample Gas Flow Rate, ACFM

$$Q_{S} = \frac{29.92}{528} \left[ Q_{SST} \right] \left[ \frac{1}{\left( 1 - B_{WS} \right)} \right] \left[ \frac{T_{S}}{P_{S}} \right]$$

$$Q_{s} = \frac{29.92}{528} [0.396] \left[ \frac{1}{(1 - 0.013)} \right] \left[ \frac{511.6}{29.47} \right]$$

$$Q_{s} = 0.395$$

### Stack Gas Viscosity at Actual Sampling Conditions

$$\mu = C_1 + C_2 T_s + C_3 T_s^2 + C_4 (\%O_2) - C_5 B_{ws}$$

Where:

$$\mu = 51.05 + 0.207[511.6] + 0.0000324[511.6]^2 + 53.147 \left[\frac{20.9}{100}\right] - 74.143 \left[\frac{1.3}{100}\right]$$
 
$$\mu = 175.58 \quad \text{micropoise}$$

### Molecular Weight of Sample Gas, Dry

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(100 - \%O_2 - \%CO_2)$$

$$\mathbf{M_d} = 0.44(0\%) + 0.32(20.9) + 0.28(100 - 20.9 - 0\%)$$

 $M_d = 28.84$  pounds / pound mole

### Molecular Weight of Sample Gas, Actual Conditions

$$M_w = M_d(1 - B_{ws}) + 18(B_{ws})$$

$$M_w = 28.83(1 - \frac{1.3}{100}) + 18(\frac{1.3}{100})$$

$$M_w = 28.70$$

### Diameter of Particles in PM<sub>10</sub> Cyclone, Microns

$$D_{50} = 0.15625 \left[ \frac{T_s}{M_w P_s} \right]^{0.2091} \left[ \frac{\mu}{Q_s} \right]^{0.7091}$$

$$D_{50} = 0.15625 \left[ \frac{511.6}{(28.70)(29.47)} \right]^{0.2091} \left[ \frac{175.58}{0.395} \right]^{0.7091}$$

$$D_{50} = 10.61$$

### Reynolds Number of Gas Flowing through the Sample Head, Demensionless

$$N_{re} = 8.64 \times 10^5 \left[ \frac{P_s M_w}{T_s} \right] \left[ \frac{Q_s}{\mu} \right]$$

$$N_{re} = 8.64 \times 10^{5} \left[ \frac{(29.47)(28.70)}{511.6} \right] \left[ \frac{0.395}{175.58} \right]$$

$$N_{re} = 3,213.4$$

### Cunningham Correction Factor, Dimensionless

$$C = 1 + 0.0057193 \left[ \frac{\mu}{P_{s}D_{50}} \right] \left[ \frac{T_{s}}{M_{w}} \right]^{0.5}$$

C = 1 + 0.0057193 
$$\left[\frac{\mu}{P_s D_{50}}\right] \left[\frac{T_s}{M_w}\right]^{0.5}$$

$$C = 1.065$$

### Diameter of Particles in PM<sub>2.5</sub> Cyclone, Microns

$$D_{50} = 0.019723 \left[ \frac{\mu}{Q_s} \right]^{0.8058} \left[ \frac{1}{C_1} \right]^{0.5} \left[ \frac{T_s}{P_s M_w} \right]^{0.3058}$$

$$D_{50} = 0.019723 \left[ \frac{175.58}{0.395} \right]^{0.8058} \left[ \frac{1}{1.065} \right]^{0.5} \left[ \frac{511.6}{(29.47)(29.70)} \right]^{0.3058}$$

$$D_{50} = 2.22$$

### Average Stack Gas Velocity, Feet/second

$$vs = K_p C_p \left( \sqrt{(\Delta p)} \right)_{avg} \left[ \sqrt{\frac{T_s}{P_s M_w}} \right]$$

vs = 
$$(85.49)(0.84)(\sqrt{(0.0973)}) \left[ \sqrt{\frac{511.6}{(29.47)(29.70)}} \right]$$

$$vs = 17.43$$

### Wet Volumetric Flue Gas Flow Rate at Stack Conditions, Cubic Feet per Minute

$$Qaw = \left\lceil \frac{60}{144} \right\rceil * vs * A$$

$$Qaw = \left\lceil \frac{60}{144} \right\rceil * 17.43 * 0.785$$

$$Qaw = 821$$

### Dry Volumetric Flue Gas Flow Rate at Standard Conditions, Cubic Feet per Minute

Qsd = 
$$\left[\frac{60}{144}\right]$$
\* Mfd \* vs \* A \*  $\left[\frac{528}{ts + 460}\right]$   $\left[\frac{Ps}{29.92}\right]$ 

Qsd = 
$$\left[\frac{60}{144}\right]$$
 \* 0.987 \* 17.43 \* 0.785  $\left[\frac{528}{511.6}\right]$   $\left[\frac{29.47}{29.92}\right]$   
Osd = 824

### Isokinetic Sampling Rate, Percent

$$I = \left(\frac{100T_{s}V_{ms}29.92}{60v\theta A_{n}P_{s}(1 - B_{ws})528}\right)$$

$$I = \left(\frac{100(511.6)(136.997)(29.92)}{60(17.43)(346.0)(0.000383)(29.47)(1-0.013)528}\right)$$

$$I = 98.5$$

### Particulate Concentration ≤ 10 Microns, Grains per Dry Standard Cubic Foot

$$C_{PM10} = \left(\frac{7000}{453,592}\right) \left[\frac{CatchWeight}{V_{ms}}\right]$$

$$C_{\text{PM10}} = \left(\frac{7000}{453,592}\right) \left[\frac{0.00105}{136.997}\right]$$

$$C_{PM10} = 0.00118$$

### Particulate Concentration ≤ 2.5 Microns, Grains per Dry Standard Cubic Foot

$$C_{PM2.5} = \left(\frac{7000}{453,592}\right) \left[\frac{CatchWeight}{V_{ms}}\right]$$

$$C_{\text{PM10}} = \left(\frac{7000}{453,592}\right) \left[\frac{0.0021}{136.997}\right]$$

$$C_{PM2.5} = 0.000237$$

### Particulate ≤10 Microns Emission Rate, Pounds per hour

$$E_{PM10} = \left(\frac{C_{PM10}}{7000}\right) * Qsd * 60$$

$$E_{PM10} = \left(\frac{0.00118}{7000}\right) 824 * 60$$

$$E_{PM10} = 0.0077$$

### Particulate Concentration ≤ 10 Microns, Grains per Dry Standard Cubic Foot

$$C_{PM10} = \left(\frac{7000}{453,592}\right) \left[\frac{CatchWeight}{V_{ms}}\right]$$

$$C_{\text{PM}10} = \left(\frac{7000}{453,592}\right) \left[\frac{0.00105}{136.997}\right]$$

$$C_{PM10} = 0.00118$$

### Particulate Concentration ≤ 2.5 Microns, Grains per Dry Standard Cubic Foot

$$C_{\text{PM2.5}} = \left(\frac{7000}{453,592}\right) \left[\frac{\text{CatchWeight}}{V_{\text{ms}}}\right]$$

$$C_{\text{PM10}} = \left(\frac{7000}{453,592}\right) \left[\frac{0.0021}{136.997}\right]$$

$$C_{PM2.5} = 0.000237$$

### Particulate ≤10 Microns Emission Rate, Pounds per hour

$$E_{PM10} = \left(\frac{C_{PM10}}{7000}\right) * Qsd * 60$$

$$E_{PM10} = \left(\frac{0.00118}{7000}\right) 824 * 60$$

$$E_{PM10} = 0.0077$$
 (1 point) (24 points = 0.0077 x 24 = 0.1848 lbs/hr)

### Particulate ≤ 2.5 Microns Emission Rate, Pounds per hour

$$E_{PM2.5} = \left(\frac{C_{PM2.5}}{7000}\right) * Qsd * 60$$

$$E_{\text{PM}2.5} = \left(\frac{0.000237}{7000}\right) 824 * 60$$

$$E_{PM2.5} = 0.0014$$
 (1 point) (24 points = 0.0014 x 24 = 0.0332 lbs/hr)

### PM 10 and PM 2.5 Emission Factors, Pounds per Ton

$$EF_{Pm10} = \frac{E_{Pm10}}{Tons/hour}$$

$$EF_{pm10} = \frac{0.1859}{907.3}$$

$$EF_{Pm10} = 0.00020$$

$$EF_{Pm2.5} = \frac{E_{Pm2.5}}{Tons/hour}$$

$$EF_{Pm2.5} = \frac{0.0332}{907.3}$$

$$EF_{Pm2.5} = 0.00004$$

# APPENDIX D.

**CALCULATIONS SHEETS** 

### Tertiary Crusher

Client: National Stone Association

Facility: Vulcan Materials Company, Pineville, North Carolina

Sampling Location: Tertiary Crusher

		TC-1	<u>TC-2</u>	<u>TC-3</u>
	Test Date	11/11/96	11/12/96	11/13/96
	Run Start Time	0914	1008	0730
	Run Finish Time	1615	1625	1345
	Net Sampling Points	12	12	12
Theta	Net Run Time, Minutes	358.58	358.58	359.59
Dia	Nozzle Diameter, Inches	0.234	0.234	0.234
Ср	Pitot Tube Coefficient	0.84	0.84	0.84
<b>Y</b>	Dry Gas Meter Calibration Factor	0.9780	0.9780	0.9780
Pbar	Barometric Pressure, Inches Hg	29.50	29.85	29.85
ΔΗ	Avg. Pressure Differential of Meter, Inches H₂0	0.49	0.48	0.48
Vm	Volume of Metered Gas Sample, Cubic Feet	144.527	145.322	145.974
tm	Dry Gas Meter Temperature, ° F	73	82	78
Vmstd	Volume of Metered Gas Sample, DSCF	138.143	138.212	139.969
VIc	Total Volume of Liquid Collected, ml	37.0	42.0	26.0
	Volume used if over saturation, ml		38.7	
Vwstd	Volume of Water Vapor, SCF	1.742	1.820	1.224
%H2O	Moisture Content, Percent by Volume	1.2	1.3	0.9
%H2O <sub>SAT</sub>	Moisture, Saturated @ Flue Gas Conditions, %	1.3	1.3	1.4
Mfd	Dry Mole Fraction	0.988	0.987	0.991
%O₂	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.71	28.70	28.75
Pg	Flue Gas Static Pressure, Inches H₂O	-0.52	-0.57	-0.39
Ps	Absolute Flue Gas Pressure, Inches Hg	29.46	29.81	29.82
ts	Flue Gas Temperature, ° F	52.0	52.4	53.9
ΔΡ	Average Velocity Head, Inches H <sub>2</sub> O	0.1624	0.1781	0.1697
VS	Flue Gas Velocity, Feet/Second	22.52	23.45	22.91
A	Stack/Duct Area, Square Inches	254.9	254.9	254.9
Qsd	Volumetric Air Flow Rate, Dry SCFM	2,398	2,524	2,470
Qaw	Volumetric Air Flow Rate, Wet ACFM	2,392	2,490	2,433
%I	Isokinetic Sampling Rate, Percent	95.2	90.5	93.4
	DIMA A DIMA & Describe College			
	PM10 & PM2.5 Results Calculations	475 74	475 77	475.45
µstack	Stack Gas Viscosity, micropoises	175.71	175.77	176.45
Qs	Flow, at Cyclone Conditions, ACFM (Actual)	0.384	0.381	0.384
Cut size	Dia. of Particles in PM10 Cyclone, Microns	10.83	10.87	10.84
Cut size	Dia. of Particles in PM2.5 Cyclone, Microns	2.28	2.29	2.29
	Particulate Catch Weights, Milligrams			
≤PM10	Less than or equal to 10 Microns	180.6	132.6	124.5
_ ≤PM2.5	Less than of equal to 2.5 Microns	35.8	41.3	37.9

### Tertiary Crusher

	Particulate ≤ 10 Microns			
gr/DSCF	Concentration, grains/DSCF	2.02E-02	1.48E-02	1.37E-02
µg/m³	Concentration, micrograms/DSCM	46170.2	33882.1	31413.0
	Particulate < 2.5 Microns			
gr/DSCF	Concentration, grains/DSCF	4.00E-03	4.61E-03	4.18E-03
µg/m³	Concentration, micrograms/DSCM	9152.2	10553.0	9562.7
	Ambient Particulate Concentrations			
µg/m³	PM10 Concentration, micrograms/DSCM	54.50	21.10	34.20
µg/m³	PM2.5 Concentration, micrograms/DSCM	22.20	13.60	28.50
	Particulate Corrected for Ambient Concentration	ons		
µg/m³	PM10 Concentration, micrograms/DSCM	46115.65	33860.99	31378.84
µg/m³	PM2.5 Concentration, micrograms/DSCM	9130.02	10539.42	9534.18
	Particulate Emission Rates, Pounds/Hour			
lb/hr	PM10 Emission Rate, lb/hr	0.4142	0.3201	0.2903
lb/hr	PM2.5 Emission Rate, lb/hr	0.0820	0.0996	0.0882
	Equipment Throughput Rate TPH			
Tons/Hr	Stone Troughput Rate during Test, Tons/Hour	952	889	1035
	Emission Factors			
lbs/Ton	Pounds of PM10 per Ton of Stone	0.00044	0.00036	0.00028
lbs/Ton	Pounds of PM2.5 per Ton of Stone	0.00009	0.00011	0.00009

### **Transfer Point**

Client: National Stone Association

Facility: Vulcan Materials Company, Pineville, North Carolina

Sampling Location: Transfer Point

		<u>TP-1</u>	<u>TP-2</u>	TP-3
	Test Date	11/11/96	11/12/96	11/13/96
	Run Start Time	1015	1003	0731
	Run Finish Time	1558	1600	1325
	Net Sampling Points	1	1	1
Theta	Net Run Time, Minutes	342.38	373.71	350.20
Dia	Nozzle Diameter, Inches	0.265	0.265	0.265
Ср	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0040	1.0040	1.0040
Pbar	Barometric Pressure, Inches Hg	29.50	29.85	29.85
ΔΗ	Avg. Pressure Differential of Meter, Inches H <sub>2</sub> 0	0.56	0.55	0.55
Vm	Volume of Metered Gas Sample, Cubic Feet	144.425	153.937	144.135
tm	Dry Gas Meter Temperature, ° F	69	76	70
Vmstd	Volume of Metered Gas Sample, DSCF	142.920	152.148	143.857
VIc	Total Volume of Liquid Collected, ml	44.0	43.0	27.0
	Volume used if over saturation, ml			
Vwstd	Volume of Water Vapor, SCF	2.071	2.024	1.271
%H2O	Moisture Content, Percent by Volume	1.4	1.3	0.9
%H2O <sub>SAT</sub>	Moisture, Saturated @ Flue Gas Conditions, %	1.4	1.3	1.0
Mfd	Dry Mole Fraction	0.986	0.987	0.991
%O₂	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.69	28.70	28.74
Pg	Flue Gas Static Pressure, Inches H₂O	-0.24	-0.32	-0.25
Ps	Absolute Flue Gas Pressure, Inches Hg	29.48	29.83	29.83
ts	Flue Gas Temperature, ° F	52.8	51.6	46.1
ΔΡ	Average Velocity Head, Inches H₂O	0.1225	0.1310	0.1225
vs	Flue Gas Velocity, Feet/Second	19.57	20.10	19.31
Α	Stack/Duct Area, Square Inches	113.1	113.1	113.1
Qsd	Volumetric Air Flow Rate, Dry SCFM	922	962	938
Qaw	Volumetric Air Flow Rate, Wet ACFM	922	947	910
%I	Isokinetic Sampling Rate, Percent	92.8	86.8	89.8
	PM10 & PM2.5 Results Calculations	475.70	475.50	
µstack	Stack Gas Viscosity, micropoises	175.79	175.58	174.55
Qs Cut size	Flow, at Cyclone Conditions, ACFM (Actual)	0.418	0.401	0.399
Cut size	Dia. of Particles in PM10 Cyclone, Microns	10.21	10.47	10.44
Cut size	Dia. of Particles in PM2.5 Cyclone, Microns	2.08	2.15	2.14
	Particulate Catch Weights, Milligrams			
<u>&lt;</u> PM10	Less than or equal to 10 Microns	58.3	45.5	38.5
<u>&lt;</u> PM2.5	Less than of equal to 2.5 Microns	16.7	14.4	11.3

### Transfer Point

	Particulate ≤ 10 Microns			
gr/DSCF	Concentration, grains/DSCF	6.30E-03	4.62E-03	4.13E-03
μg/m³	Concentration, micrograms/DSCM	14406.2	10561.3	9451.5
	Particulate < 2.5 Microns			
gr/DSCF	Concentration, grains/DSCF	1.80E-03	1.46E-03	1.21E-03
μg/m³	Concentration, micrograms/DSCM	4126.6	3342.5	2774.1
	Ambient Particulate Concentrations			
µg/m³	PM10 Concentration, micrograms/DSCM	54.50	21.10	34.20
µg/m³	PM2.5 Concentration, micrograms/DSCM	22.20	13.60	28.50
	Particulate Corrected for Ambient Concentrati	ons		
µg/m³	PM10 Concentration, micrograms/DSCM	14351.65	10540.21	9417.33
μg/m³	PM2.5 Concentration, micrograms/DSCM	4104.43	3328.88	2745.59
	Particulate Emission Rates, Pounds/Hour			
lb/hr	PM10 Emission Rate, lb/hr	0.0496	0.0380	0.0331
lb/hr	PM2.5 Emission Rate, lb/hr	0.0142	0.0120	0.0096
	Equipment Throughput Rate TPH			
Tons/Hr	Stone Troughput Rate during Test, Tons/Hour	952.1	889.0	1034.9
	Emission Factors			
lbs/Ton	Pounds of PM10 per Ton of Stone	0.000052	0.000043	0.000032
lbs/Ton	Pounds of PM2.5 per Ton of Stone	0.000015	0.000013	0.000009

Client: National Stone Association

Facility: Vulcan Materials Company, Pineville, North Carolina

Sampling Location: Vibrating Screen

		<u>VS-1</u>	<u>VS-2</u>	<u>VS-3</u>
	Test Date	11/18/96	11/19/96	11/20/96
	Run Start Time	0749	0741	0734
	Run Finish Time	1525	1400	1327
	Net Sampling Points	1	1	1
Theta	Net Run Time, Minutes	346.00	347.90	344.89
Dia	Nozzle Diameter, Inches	0.265	0.265	0.265
Ср	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0040	1.0040	1.0040
Pbar	Barometric Pressure, Inches Hg	29.50	29.20	29.15
ΔΗ	Avg. Pressure Differential of Meter, Inches H <sub>2</sub> 0	0.51	0.5	0.5
Vm	Volume of Metered Gas Sample, Cubic Feet	138.954	140.842	137.882
tm	Dry Gas Meter Temperature, ° F	70.6	70.5	68.1
Vmstd	Volume of Metered Gas Sample, DSCF	136.997	137.470	134.961
VIc	Total Volume of Liquid Collected, ml	67.0	51.0	33.0
	Volume used if over saturation, ml	38.34		
Vwstd	Volume of Water Vapor, SCF	1.805	2.401	1.553
%H2O	Moisture Content, Percent by Volume	1.3	1.7	1.1
%H2O <sub>SAT</sub>	Moisture, Saturated @ Flue Gas Conditions, %	1.3	1.7	1.6
Mfd	Dry Mole Fraction	0.987	0.983	0.989
%O₂	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.70	28.66	28.72
	Flue Gas Static Pressure, Inches H₂O	-0.46	-0.42	-0.46
Pg	Absolute Flue Gas Pressure, Inches Hg	29.47	29.17	29.12
Ps 4-	Flue Gas Temperature, ° F	51.6	58.0	56.4
ts		0.0973	0.0999	0.0870
ΔΡ	Average Velocity Head, Inches H₂O	17.43	17.86	16.65
vs	Flue Gas Velocity, Feet/Second	113.1	113.1	113.1
Α .	Stack/Duct Area, Square Inches	824	822	772
Qsd	Volumetric Air Flow Rate, Dry SCFM	821	842	785
Qaw	Volumetric Air Flow Rate, Wet ACFM	98.5	98.6	103.9
%I	Isokinetic Sampling Rate, Percent	00.5	00.0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	PM10 & PM2.5 Results Calculations			
µstack	Stack Gas Viscosity, micropoises	175.58	176.82	176.88
Qs	Flow, at Cyclone Conditions, ACFM (Actual)	0.395	0.405	0.398
Cut size	Dia. of Particles in PM10 Cyclone, Microns	10.61	10.53	10.66
Cut size	Dia. of Particles in PM2.5 Cyclone, Microns	2.22	2.21	2.25
	Particulate Catch Weights, Milligrams			
<pm10< td=""><td>Less than or equal to 10 Microns</td><td>10.5</td><td>20.5</td><td>12.3</td></pm10<>	Less than or equal to 10 Microns	10.5	20.5	12.3
<u>≤</u> PM2.5	Less than of equal to 2.5 Microns	2.1	3.9	2.9

### Vibrating Screen

	Particulate < 10 Microns			
gr/DSCF	Concentration, grains/DSCF	1.18E-03	2.30E-03	1.41E-03
µg/m³	Concentration, micrograms/DSCM	2706.8	5266.5	3218.6
	Particulate < 2.5 Microns			
gr/DSCF	Concentration, grains/DSCF	2.37E-04	4.38E-04	3.32E-04
µg/m³	Concentration, micrograms/DSCM	541.4	1001.9	758.9
	Ambient Particulate Concentrations			
/3	• •	197.30	35.20	58.30
µg/m³ µg/m³	PM10 Concentration, micrograms/DSCM PM2.5 Concentration, micrograms/DSCM	92.90	22.90	42.70
рулп	1 WZ.0 Gonociniation, moregramore	•=.00		
	Particulate Corrected for Ambient Concentrate	ions		
μg/m³	PM10 Concentration, micrograms/DSCM	2509.47	5231.26	3160.32
μg/m³	PM2.5 Concentration, micrograms/DSCM	448.45	979.01	716.16
	Point Particulate Emission Rates, Pounds/Ho	ur		
lb/hr	PM10 Emission Rate, lb/hr	0.0077	0.0161	0.0091
lb/hr	PM2.5 Emission Rate, lb/hr	0.0014	0.0030	0.0021
	Total Particulate Emission Rates, Pounds/Hot	ur		
24 Points	PM10 Emission Rate, lb/hr	0.1859	0.3865	0.2193
24 Points	PM2.5 Emission Rate, lb/hr	0.0332	0.0723	0.0497
	Equipment Throughput Rate TPH			
Tons/Hr	Stone Troughput Rate during Test, Tons/Hour	907.3	906.3	1123.3
	Emission Factors			0.00055
lbs/Ton	Pounds of PM10 per Ton of Stone	0.00020	0.00043	0.00020
lbs/Ton	Pounds of PM2.5 per Ton of Stone	0.00004	0.00008	0.00004

Client: National Stone Association

Facility: Vulcan Materials Company, Pineville, North Carolina

Sampling Location: Fines Crusher

		FC-1	FC-2	FC-3
	Test Date	11/18/96	11/19/96	11/20/96
	Run Start Time	0838	0748	0736
	Run Finish Time	1330	1415	1352
	Net Sampling Points	12	12	12
Theta	Net Run Time, Minutes	180.00	358.50	359.83
Dia	Nozzle Diameter, Inches	0.234	0.234	0.234
Ср	Pitot Tube Coefficient	0.84	0.84	0.84
Y	Dry Gas Meter Calibration Factor	1.0080	1.0080	1.0080
Pbar	Barometric Pressure, Inches Hg	29.50	29.20	29.15
ΔΗ	Avg. Pressure Differential of Meter, Inches H <sub>2</sub> 0	0.48	0.48	0.47
Vm	Volume of Metered Gas Sample, Cubic Feet	72.412	145.334	144.449
tm	Dry Gas Meter Temperature, ° F	70	75	72
Vmstd	Volume of Metered Gas Sample, DSCF	71.752	141.215	140.928
VIc	Total Volume of Liquid Collected, ml	95.0	43.0	39.0
	Volume used if over saturation, ml	20.1		
Vwstd	Volume of Water Vapor, SCF	0.945	2.024	1.836
%H2O	Moisture Content, Percent by Volume	1.3	1.4	1.3
%H2O <sub>SAT</sub>	Moisture, Saturated @ Flue Gas Conditions, %	1.5	1.8	1.7
Mfd	Dry Mole Fraction	0.987	0.986	0.987
%O₂	Oxygen, Percent by Volume, Dry	20.9	20.9	20.9
Md	Gas Molecular Weight, Lb/Lb-Mole, Dry	28.84	28.84	28.84
Ms	Gas Molecular Weight, Lb/Lb-Mole, Wet	28.70	28.69	28.70
	Flue Gas Static Pressure, Inches H₂O	-0.41	-0.4	-0.39
Pg _		29.47	29.17	29.12
Ps	Absolute Flue Gas Pressure, Inches Hg	54.6	59.6	57.7
ts	Flue Gas Temperature, ° F	0.1665	0.1673	0.1459
ΔΡ	Average Velocity Head, Inches H <sub>2</sub> O	22.85	23.14	21.59
vs	Flue Gas Velocity, Feet/Second	22.65 254.9	25.14 254.9	254.9
Α	Stack/Duct Area, Square Inches	2,421	2,400	2,247
Qsd	Volumetric Air Flow Rate, Dry SCFM	2,421	2,400 2,457	2,293
Qaw	Volumetric Air Flow Rate, Wet ACFM	2,421 97.6	97.3	103.3
%1	Isokinetic Sampling Rate, Percent	97.0	37.3	100.0
	PM10 & PM2.5 Results Calculations			
µstack	Stack Gas Viscosity, micropoises	176.30	177.42	177.05
Qs	Flow, at Cyclone Conditions, ACFM (Actual)	0.400	0.403	0.400
Cut size	Dia. of Particles in PM10 Cyclone, Microns	10.56	10.60	10.63
Cut size	Dia. of Particles in PM2.5 Cyclone, Microns	2.21	2.23	2.24
	Particulate Catch Weights, Milligrams			
<pm10< td=""><td>Less than or equal to 10 Microns</td><td>23.4</td><td>37.7</td><td>24.6</td></pm10<>	Less than or equal to 10 Microns	23.4	37.7	24.6
<u>≤</u> PM1.5	Less than of equal to 2.5 Microns	5.1	9.5	6.0
SEIVIZ.O	2000 (1011 01 0400) to 2.0 (1012-011			

### Fines Crusher

	Particulate ≤ 10 Microns			
gr/DSCF	Concentration, grains/DSCF	5.03E-03	4.12E-03	2.69E-03
µg/m³	Concentration, micrograms/DSCM	11517.4	9428.3	6164.7
	Particulate < 2.5 Microns		4.045.00	0.575.04
gr/DSCF	Concentration, grains/DSCF	1.10E-03	1.04E-03	6.57E-04
μg/m³	Concentration, micrograms/DSCM	2510.2	2375.8	1503.6
	Ambient Particulate Concentrations			
µg/m³	PM10 Concentration, micrograms/DSCM	197.30	35.20	58.30
μg/m³	PM2.5 Concentration, micrograms/DSCM	92.90	22.90	42.70
	Particulate Corrected for Ambient Concentration			0.100.00
µg/m³	PM10 Concentration, micrograms/DSCM	11320.10	9393.09	6106.38
µg/m³	PM2.5 Concentration, micrograms/DSCM	2417.30	2352.93	1460.88
	Particulate Emission Rates, Pounds/Hour			
lb/hr	PM10 Emission Rate, lb/hr	0.1027	0.0844	0.0514
lb/hr	PM2.5 Emission Rate, lb/hr	0.0219	0.0212	0.0123
	Equipment Throughput Rate TPH		0545	252.4
Tons/Hr	Stone Troughput Rate during Test, Tons/Hour	249.5	254.5	252.4
	Emission Factors	0.00044	0.00022	0.00020
lbs/Ton	Pounds of PM10 per Ton of Stone	0.00041	0.00033	
lbs/Ton	Pounds of PM2.5 per Ton of Stone	0.00009	0.00008	0.00005

### APPENDIX E.

### FIELD DATA SHEETS



# VELOCITY TRAVERSE DATA

SAMPLING LOCATION Crusher 29.30 Bar Press (in HG) Wary Materials Pitot Typo Plant Post Leak Ch∞k Pitot No. City Stack Diameter (in) 0.84 Operatoor BRUM Pitot Cp CO2/O2 Analysis By Thermocoupic 11-10-96 Date TRANSFER MERASUREMENT DEVICE ERTIARY Run No. 1203 Time Ts(DB) deg F Micrommanometer Ts(WB) dog F -0.26 -.52 Pg(in H2O) 10" Mannometer Ps(in HG) CO2.% Magnezhelie 02% Dolta P Delta P point Dolta P port Other 0.08 26 Explainini 45 0.08 2 ط4 16 0.10 40 TRAVERSE SCHEMATIC 10.14 0.12 45 <u>10.18</u> 44 10.12 10.18 10.03 44 ₩*0.* เา <del>20</del>0.15 10.18 0.20 46 10.17 Ps = TPbar + Pg/13.6Moista(%) = 100(3ns) $Md = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CO) Ms = Md(1-Bws) + 18BwsSqrt. 12 May 2012 10.291 Average Vs == 85.49Cp(sqn[(Doliz P)avg])Moist (%) x sqrt[(Ts + 460)/MsPs)]Moist (Buz) Md(lb/lbmole) Qa = 60Vs.A.sMs(lb/lbmole) 22.47 16.22 Vs (ft/s) Qs = Qa[528/(Ts + 460)](Ps/29.92)76461 Qa (ac(m) 2435 x(1 - Bws)Qs (dsc[m) 1246



# VELOCITY TRAVERSE DATA

SAMPLING LOCATION Tertiary Crusher Bar Press (in HG) 29.55 VULGA Pitot Typs Plant Post Lask Check Pitot No. charlotte 18" City Stack Diameter (in) Pitot Cp Operator \_ BPalm CO2/O2 Analysis By \_\_\_\_ Thermocouple 11-11-96 Date MEASUREMENT DEVICE 1209 Run No. Pre-1623 Time Ts(DB) dag F Micromanometer Ts(WB) deg F -0.5351 Pg(in H2O) -0.52 10" Manometer Ps(in HG) CO2 % <u>6.0</u> 0.0 Magnahelia 20.9 20.9 02% Delta P Ts Dalta P Ts Ts point | Dalta P | ल्ला Other 10.1100 .2171 34 Α Explain: AN Octo Maki-Meter TRAVERSESCHEMATIC 34 0.1043 . 1294 34 0.1342 3 13021 0.1833 2013 . 1987 0.1858 .4443 <u>||0.1839|</u> 34 6. 1495 34 ß 0.1298 34 1542 34 0.1354 1324 10.1814 1877 34 0.1598 34 1707 0.1573 1698 34 Ps = Pbar + Pg/13.6Moist(%) = 100(Bus) $Md = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CO) Ms = Md(1-Bws) + 18Bws150n0.4/2 Average Vs = 85.49Cp(sqrt[(Dolta P)avg])Moist (%)  $x \operatorname{sqrt}[(Ts + 460)/MsPs)]$ Moist (Bws) Md(l5/lbmole) Qa = 60Vs.A.sMs(lb/lbmole) Vs (IUs)  $Qs = Qa[528/(Ts \div 460)](Ps/29.92)$ Qa (ac(m) x (1 - Bws) Os (dsc(m)



# METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 2

	ылметен 0.234	K FACTOR	YAC (in, Hg)	1010	مات	7	
RUN NUMBER	NOZZLE NUMBER DIAMETER   0.234	CD2 CONTENT	NOUT I'EMP (deg. F)	252	65.00	222	76 76 AVE TEMP. 13.020
# HUN!	идтн і туре	02 CONTENT %	SIL GEL IMPINGER TEMP (deg. F)	2000	5000	29 62 63 63	65
Z.5 & (0)	PROBE LENGTH AND LINER TYPE 4'TEFLON	LEAK CHECK (FINAL) O.OOO	FILTER OVEN TEMP (deg. F)				
SAMPLE TYPE ZOIA (2,54	рпот Ср	CHECK CHECK (INTAL) 0.008	PHOBE TEMP (deg F)				28.0
NC	STACK ID (In.)	OHSAT	STACIK TEMP (deg. F)	2 6 6	944	64 22	52 52 52 ANE TEMP 51,412
SAMPLING LOCATION ERT, CRUSHER	FILTER NUMBERS 004	STACK PITOT NO.	delta H ORIFICE (in: H2O)	0,49			AVE della H
SAMPLII TERT.	AMBIENT TEMP (deg. F) 4916	STACK THERIM NO.	delta P VELOCITY HEAD (In: H2O)	2,2,0	#6210	0.20	0.199 AVE SGRT delta P
11/11/95	STATIC PRESS (in. Hg)	DGM CAL FACTOR (Y) 0.978	DGM HEADING Vm (cu ft)	446.853 450.85 454.83	460.30 462.81 466.75	-1	491, 14 491, 14 DGM VOLUME
IE NC	AMBIENT PRESS (In. Hg) 29, 50	ପତାନ ⊩@ /,893	CLOCK TIME (24-HR)	9:14			08.33
PLANTAND CITY CÂN -PINEUIC		рам вохие. М5-7	ELAPSED TEST TIME (MIN)	0/	33.45 40 50	59:55 70 86:00	100 110 10TAL TIME
PLANT AND GITY YVLCAN - PINEUM	оренатон ВНК	АВБОМЕD МОІЗТИЯЕ (%)	TRAV. POINT	1-V	A-42	K 1 1 4	A-5

EMISSION TESTING

Page 2 of 5

		SAMPLE THAIN ACUU (In: 110)	7	7	1	1	1	1	1	1	7	7	7	201	7	7	7.5	7.5	15	7.5	7.5			Dalo
		NIOUT AUX. TEMP TEMP.	<u>                                      </u>	7	7	76	シャ 十	9,	95		18	28	77	8/	8/	7	2/	77	77.	78	28		DGMT	
HUN NUMBER	#	Sil GEL DO	≋1 <u> </u>	58 7	57 7	54 7	54 17	55	56 1	7 95		56		157	<u> </u>	57	150	57	57	56	- 56	·	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	136
יייטונות.	(0/85			-				-			-	-  -  -	-	-		  -  -	-	-		-				Shoot Chocked Uy:
	SAMPLES 1112	I	****  ***	 				     							7		1 7	12		1	1/4	4	AVG SIIK (:	.s
\$2.50 miles in a common and a c	SAMPLING LOCATION	LKISALEK H. STACK	- CONTRACTOR		049 52	<u> </u>	1 -	52	50	15	122	1	1	<b>万</b> 十	10	12	1	1	77	1	1	100	NVG (1)	
	SAMPLING	JENOCHY COM	<u> </u>	0,177 0,	0188	1	5	0177	-1	-	777	a124 -		*	0.132			-178/7	*		1///	1	AVG SCIELL P	
	DVIE	89	201		54	7	79		27		46		65	95	90		.21	71	96	.38	.53	657	30000	
	,	EM		498.	503.	507	110	218	200	727,	528,	532.	536.	541	545.	549	553	555	560.	565	567		70	
	PLANT AND GIT	- PINEVIC		130	140	150:55	091	170	00:00/02:28	01/06/	7 00/20	30:10	8	50	58:30	100	08	84.55	001	011	02:911	130	140 IOIM	(TILATE
Ē	), <u>Uu</u>	1 <b>~</b>	ANION NION	<u>                                     </u>	1/5	A-6 15	\$ 16		8-18		7	2-2	14	1	8-3	1		8-4	1		2-5	00	00	004

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	SAMPLE SABAYLL THAIN ACUU (In: Hg)	75	75		 						_	_	1			_	Dato
	AUX TEMP: ( P)			- 1				<u> </u> 		_					<u> </u>	1	
	DGM INCUT TEAP (F)	28	98											1		AVG	Dew
#	SILGEL ISILGEL IEMP LEMP	56	56														
2	E FRE					·  -  -										4	All hadout Disch
201A 1087.																8008	
9	STACK	54	54													VA	STICE
COT CORULE	OF ILE	0.49	0.47	1												SW	<b>****</b>
はらり	VELOCUTY NECOCUTY NECOCUTY NECOCUTY	07.70		1												AVGSOH	à-
	SMETELL READING			591.380												WEST	VOLUME
ND OILK	PINEVICE NC	(m=(2)															
	AN - F	18	09/	176.15													TOTAL
	ZZINIOA AMILL AMILL	388		END													000 Page Sign

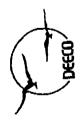


# VELOCITY TRAVERSE DATA

SAMPLING LOCATION

Point Tertiary Crusher <u> 29.85</u> Bar Press (in HG) Pitot Typ= Vulcas Post Loak Ch∞k Plant Pitot No. Charlotte 18" City Stack Diameter (in) Pitot Cp Operator BPalm CO2/O2 Analysis By \_ Thermo∞uple 11-12-96 Date MEASUREMENT DEVICE Run No. Time 0711 Ts(DB) dag F 32 Micromanomater Ts(WB) dog F 📗 30 -6-35 -0.5661 -0.6559 Pg(in H2O) 10" Manometer Ps(in HG) CO2 % 0.0 0.0 Magnehelie 20.9 20.9 02% Delta P Delta P I Ts point | Delta P Ts port Other 0.16291 10.0650 0.1769 Explain: 0.14611 0.1485 0.1330 0.14391 10.1926 TRAVERSE SCHEMATIC 0.17321 0.1962 0.1628 0.2000 0,1578 0.1805 1965 12.2112 B 0.1681 10.2849 0.1411 10.1466 0.1947 10.2016 10.1575 10.1945 0.1717 10.1994 Ps = Pbar + Pg/13.6Moist(%) = 100(3"z)Md = 0.44(%CO2) + 0.32(%O2)+ 0.28(%N2 + %CO) Ms = Md(1-Bws) + 18BwsSart 10.406 Average 138 Caro Vs = 85.49Cp(sqrt[(Dolta P)avg])Moist (%)  $x \operatorname{sqrt}(Ts + 450)/M \operatorname{sPs})$ Moist (Bws) Md(lb/lbmole) 2A.2V00 = 5QMs(lb/lbmole)  $Qs = Qa[528/(Ts \div 460)](Ps/29.92)$ Vs (ft/s) Qa (acfm) x(1 - Bws)Os (dsc(m)





# METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 3

	NOZZLE NUMBER DIAMETER — 0.234	K FACTOR	SAMPLE THAIN VAC (in Hg)	ر می		22		
NUMBER	NOZZLE NUMBER [	CONTENT	DOM IN/OUT TEMP (deg.F)	72 73	8778	2500	\$2 E	TEMP.
#2	COBE LENGTH  ND LINER TYPE  4.7EFLON	CONTENT %. 20.9	SILGEL IMPINGER TEMP (deg, F)	4 22	25,5	5000	50 44 49	
7YPE 2.5&10	AND LINER TYPE  4/TEFLON	CHECK 2008 0008	FILTER OVEN TEMP (deg F)	1				
SAMPLE TYPE	риот Ср	LEAK CHECK (AMA)	PHOBE TEMP (deg. F)					
ION IER	STACK 1D (In.)	OHGAT N/O.	STACK TEMP (deg. F)	884	2000	522	02144 0224	TEMP
SAMPLING LOCATION FRT. CRUSHER	FILTER NUMBERS 00/2	STACK PITOT	delt# H* CHIFICE (in H2O)	0.48				della H
TERT	AMBIENT TEMP (deg. F)	STACK THERM NO.	della P VELOCITY HEAD (m. H2O)	0.177	0.133			della P
11/12/96	STATIC PHESS (in: Hg) -0.566	Бам. САЦ. FACTOR (Y)	DGM HEADING Vm (cu ft.)	608.384	620.03 620.03 624.10	636.75	1,001	VOLUME
מבימכ	AMBIENT PRESS (In. Hg) 29,85	рам н@ 1/893	CLOCK TIME (24-HR)	80:01				
PLANTAND CITY C <b>ÁN - PINEV</b> IL		DGM BOX No. M5-7	ELAPSED TEST TIME (MIN)	029	28:45	23:40	83:40 100 110 113:50	TOTAL
VOLCHN	оренатон ВНК	ASSUMED MOISTURE [%]	THAV. POINT NO.	A-,/	A-2	A-3	A-4 A-5	

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	The second secon							THE COURSE OF THE PARTY OF THE					
VICAN	- PINEVILL	IE. NC		<i>36/21/11</i>	TERT.	TERT. CRUSHER	ž	MZOIA	M201A 2.5 810	7#			
TRAV.	ELAPSEU TEST CLO TIME TIME	CLOCK TIME (24-hr)	GAS METER READING Vm.(13)		VELOCITY HEAD	H ORIFICE (II. H20)	STACK TEMP	PROBE TEMP	FILTER OVEN TEMP (F)	SILGEL IMPINGER TEMP (F)	DGM IN/OUT TEMP (F)	AUX. TEMP. (F)	SAMPLE TRAIN ACUU (In: Hg)
ŝ.	8 <b>4</b>		660.8			0.48		1.		51	名	)	7
	140	-		_		0,48	50			20	84		7.5
2	144:20		666.6	2		0.48	20			50	84		7.5
	09/		1	86		0,48	50			51	85		7.5
1	170		<b>6</b>	66		0.48	51			51	84		7.5
1	8	1:30 PM	678	50		240	52		1.	52	82		7.5
1			682.5	-		0.48	25			52	82		2.5
	208		667	_		0,48	25			25	82		7.5
7	31:70		691 64	14		0.48	25			53	82		75
	40		5.	2		0.48	25			25	83		7.5
1	50			<b>X</b> &		0.48	25			53	84		7.5
3	67:50		ı	36		048	53			54	84		57
$\prod_{i=1}^{n}$	70		40 1	2		0.43	53			54	82		7.5
1	<i>8</i>		9	A		0.48	53			55	83		04
8-4	94:00	8	8 346.62	716.7	~	048	53			55	\$		00
	001		11.616			0.48	53			42	83	_	$\propto$
1	011		773.1	5		0.48	B	_		54	\$		00
8-5	124:40					0.48	53			55	84		00
	130		731.3	2		0.48	53			55	E	9	S
1	140	-	735.4	3		0.48	53			55	8		$\sim$
Page	TOTAL		D VOI	VOLUME	AVG SORT P	H. H	STK F		1		AVG DGM F	:	
		ل						7				,	

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SAMPLE TRAIN ACUU (In. Hg)  $\infty$ Dale AUX. TEMP. ( F) RUN NUMBER DGM IN/OUT TEMP ( F) AVG DGM\_I 85 8 B SIL GEL IMPINGER TEMP (F) 54 R A Sheet Checked By: FILTER OVEN TEMP SAMPLETYPE M20/A Phose TEMP (F) AVG STK F SAMPLING LOCATION STACK TEMP ( P) TERT. CRUSHER AV6 H. H ORIFICE (in: H2O) 0.48 AVG SORT P VELOCITY HEAD (In: H20) DGM: ---VOLUME 96/21/11 DATE GAS METER READING Vm (t3) GLOCK TIME (24-hr) PLANT AND CITY - PINEVIL 358.40 TOTAL ELAPSED TEST TIME (min) 154:45 185:18 02 09/ TRAV. POINT NO. Page Tolals GNB 3  $\infty$ 

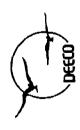
> 84:45 90 100 1(5:15

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## VELOCITY TRAVERSE DATA

	SAM	PLING LOCATION	NCNC			
. [	TC					
	n		_ Bar Pr=s (in	HG)	29.90	
1211 <u>017(720</u>	Pitot Typ= Pitot No.		Post Last Ca	.⇒ck		<u> </u>
1737 (2010) (2011)	Pitot Cp	0.84	Stack Dizme	ter (în)	<u> 18."</u>	<u></u>
Jps:2101 174441	Thermomuple		CO2/O2.4_fiz	Jysis By		<del></del>
Dats	•	,			<u> </u>	· ·
MEASUREMENT DEVICE	Run No.	9e/3	11 Xest/3		<u>}</u>	
	Time	6705	1354		<u> </u>	
	Ts(DB) deg F	32			<u> </u>	———
• •	Ts(WB) dog F	30		-/1	<u> </u>	
	Pg(in H2O)	-0.6358	1-0.675	<del>****</del>	B.	
	Ps(in HG)		0.0		ì	
Magnehelic 🔲	CO2 %	0.0	20.9		<u>:</u>	
	02%	20.9   Dala P   Ts		TS.	Delm P	Ts
Other 🔟	non indiat		1 2.17451		1 1	
Emisia, S. M. N. C.	<u> </u>	0.2349	0.1607		1	
ANDATA METER TRAVERSESCHEMATIC	1 2	10.1691	0.1163	<u> </u>		
TRAVERSESCHEMATIC	1 4	10.1986	0 1957			
•	1 3	0.2024	0.1381		<u>i</u>	
	16	10.17761	10.16381			
	13 1	10.18631	10.1601		¥	
;	12	10.1771	10.1358		§	
• •	13	10.16081	10.13781		8	<u> </u>
	14	10.1841	10.16441		1	
	15	10.1827	10.13611			
	16	10.1863	110.14 121		<u>i</u>	
	· ·	1	1		<u> </u>	<u> </u>
, · ·					<u> </u>	<u> </u>
		9			<u> </u>	<u>                                       </u>
	<u> </u>	1		<u> </u>	<u> </u>	1
Ps = Pbar + Pg/13.6		î l	11	<u> </u>	1	<u> </u>
		9		<u> </u>		<u> </u>
Moist(%) = 100(Bnz)		1		<u> </u>		<u> </u>
111031(70) 11 200(2110)		1	1			
$Md = 0.44(\%CO2) \div 0.32(\%O2)$				<u>!</u>		<u> </u>
÷ 0.28(%N2 ÷ %CO)	- <del>-</del> T		<u> </u>	<u> </u>		<u> </u>
1 222(33 2 33 2 3				<u> </u>		<u> </u>
Ms = Md(1-Dws) + 18Dws				<u> </u>	<u> </u>	
,		1		1	<u> </u>	
Vs = 85.49Cp(sqn[(Dolta P)avg])	Average	50rt 0.43)	ी:वत	<u> </u>	<u>Bert</u>	<del></del>
x sqrt[(Ts+460)/MsPs)]	Moist (%)			<u> </u>	<u> </u>	_!
	Moist (Bus)	1		<u> </u>		
Qz = 60VsAs	iomd(lb/lbmoi	c)	<u> </u>	<u> </u>		
·	Ms(Ib/Ibmol	e)		<u> </u>		
Qs = Qa[528/(Ts + 460)](Ps/29.92)	Vs (It/s)			<u> </u>		
x (1 - Bws)	Qa (ac(m)	1				
1 ' '	Os (dsclm)	-	}		ß	



PAGE 1 gl 3

	NOZZLE NUMBER DIAMETER	0.234	K FAGTOR		SAMPLE	VAC (in. Hg)	و	9	9	٥	20	6.5	65	6.5	6.5	6.5	6.5	7	
RUN NUMBER	NUMBER D		8	0	DGM TUO/N		50	54	57	09	65	2	70	72	75	76	76.	78	AVE. TEMP.
#	PROBE LENGTH AND LINER TYPE	4'TEFLON	CONTENT	20.9	SIL GEL IMPINGER	TEMP (deg. F)	38	39	40	45	46	48	49	3/	52	53	53	52	
7YPE 2.5\$ 10	PROBE-	4,1	CHECK	0.015	FILTER	TEMP (deg. F)	)							-			11/1	>	1
SAMPLE TYPE MZ01A 2.5.	PITOT Cp	0.84	CHECK	0.018	ЭВОЫ	TEMP (deg. F)		-							_		71	À	
NOI	9	//8//	OHSAT		STACK	TEMP (deg F)	46	//	`	"	48	50	53	53	55	55	55	55	AVE. TEMP.
SAMPLING LOCATION TRT, CRUSHER	FILTER NUMBERS		STACK PITOT		cleifa H	ORIFICE (m. H2O)	0.48				-			_			,	A	AVE della H
SAMPL TERT, O	AMBIENT TEMP	32452	STACK THERIM		delta P VELOCITY	HEAD (In. H2O)													AVE SORT delta P
DATE 11/13/96	STATIC PRESS (in Hd)	-0.64	DOM CAL CAL	0.978	MBQ	READING Vm (cu.ft)	754.078		762.21	767.51	774 10			786.25	790.70	1794.35		120351	VOLUME
E NC	AMBIENT PRESS (In. Ha)	29.62	©H H©	1.893	CLOCK	TIME (24-HR)	7.30Am												
PLANT AND CITY SAN - PINEVILLE	H		DGM BOX No.	M5-7	ELAPSED	THME (MIN)	0	01	20	33.45	20	62:20	70	08	91:00	001	110	/22:05	TOTAL
VILCAN -	OPERATOR	BHK	ASSUMED MOISTURE	0.8%	THAV	LNIO4	A-1	//	*	A-2	**	A-3	"	//	A-4	//	"	A-5	

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A Za		SAMPLE TRAIN ACUU (in: Hg)	7	7	7	7	7	7	7	7	7	7	5	2.5	2.5	7.5	∞	<i>∞</i>	<i>S</i>	$\infty$	0	0	1	
7		SA NUX, TEMP, A TEMP, A	.							•			7		2		`					<b>)</b>		Date
RUN NUMBER		DGM IN/OUT TEMP C G	- 61	08	18	82	83	18	83	83	84	83	85	85	88	85	85	84	58	85	85	<i>SE</i>	AVG DGM F	
HUN	#3	SILGEL IMPINGER TEMP (F)	53	54	55	55	25	62	62	19	09	09	19	09	59	09	09	19	09	29	29	63		_
LYPE	3810	FILTER OVEN TEMP																						Shaat Chackad Bv
SAMPLETYPE	201A 2	PROBE TEMP (F)	-																		>	>-		Shoot Ch
	123	STACK I TEMP (*F)		53	55	95	09	09	95	65	55	54	55	53	55	54	55	()	27	2%	57	28	AVG STK F	
SAMPLING LOCATION	CRUSHER	H ORIFICE (In: H20)	0.48			7	9	)		7	-,	7			4 )	- 1	7	7	4		5	5	AVG H	-
SAMPLI	TEKT	VELOCITY HEAD (In: H20) ((	1							<del>,</del> -					<u> </u>	<u>, , , , , , , , , , , , , , , , , , , </u>							AVG SORT P	
DĄTE	96/21/					-		145		3			_	2)	2				2					
	/\c	GAS METER READING Vm (II3)	806.44	10,50	13.91	18.55	23.22	7:7	31.86	5.9	10.06	14.1	848.18	852.05	56.4	860.59			72.7	75.70		24.94	VOLUME	
SIT.	#17//	CLOCK TIME (24-hr)	<u> </u>	8	00	18	78	41A18	183	83	Š	84	$\infty$	8	8	∞			00	<u>~</u>	<b>}</b>	88		]
PLANT AND CITY	-PINI	LAPSED TEST CLO TIME TII (min) (24	0	40	153:20	091	077	182-400 1041 AMS.	,	0	30:00	0	20	69:20	0	0	87:15	100	011	117:05	30	0	TIME	7
7 B	MCAN		5 13(							20	١.,	4	2			08	4	7		5		£		
	<u> </u>	TRAV. POINT	A-5	1	A-6	1	2	8-	1	1	8-2	*	*	8-3	0	1	8	1	1	8	1	1	Page	<b>5</b> %

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<b>EMISSION</b>	

		SAMPLE TRAIN ACUU (h. Hg)	8	S	∞	1												
ER .		AUX. TEMP. ( F)				>							1					J Dafe
RUN NUMBER		DGM IN/OUT TEMP ( F)	98	<i>L8</i>	98												AVG DGM*F	
OH HO	#3	SILGEL IMPINGER TEMP (F)	63	<i>59</i>	23													
TYPE	5410	FILTER OVEN TEMP (° F)	_			Ą		•										Shaat Chackad By
SAMPLETYPE	201A 2	Phobe TEMP ( F)	\-			<b>^</b>												Shaat
ATION	ER	STACK TEMP (*B)	36	35	56	-											STIC	
SAMPLING LOCATION	TERT. CRISHER	H ORIFICE (In: H2O)	0.48			À											H) EVA	
SAME	1	****															AVG SORT	
DATE	U.E. NC 11/13/96	GAS METER READING Vm (13)		393.15	05.768	300.006											DGM: *- VOLUME *	
ND GITY	- PINEVII	CLOCK TIME (24-hr)	1			\	65		!									
PLANT AND GITY	AN - F	ELAPSED TEST TIME (min)	146:50	160	0/_/	176:55	25,655										TOTAL	
		TRAV. POINT NO.	8-6	1	*	END											Page	lolais



## PARTICULATE/SAMPLE RECOVERY DATA SHEET

Client/Location:	Vulcan	/ Tertive	U Crosl	ner Sami	oling Date	(s): 11-41		
1	,		1		ecovered 1	9	<b>,</b>	
RUN No.:	Kecc	2	3	4	5	6	Silica Gel	
Final Wt.	94	103	_3_			/	217	
Imitial Wt.	100	100	0				180	
Net Weight	-6	3	3	<u> </u>		<u> </u>	37	
Description of I Silica Gel Color Filter I.D. No.: Description of I Probe Rinse Cont Impinger Content	Particulat tainer I.D	e on Filt	  er: NA	Percent S Filter Co Liqu Liqu	pent: ntainer I	Se Marked/Se Marked/Se	aled: Y N ealed: Y N ealed: Y N	
Impingers:	1	2	3	4	5	6	Silica Gel	
Final Wt.	98	109	0	/	/_/		235	
Initial Wt.	100	100	0				200	
Net Weight	-2	9					35	
Description of Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten	r: : Particula tainer I.	te on Fil		Percent S Filter Co	Spent: ontainer l uid Level uid Level	65 .D.:S Marked/S	grams  * ealed: Y N ealed: Y N	٠.
RUN No.: 3	Rec	covery Da	te: <u> //</u> 3	13 4	Recovered 5	By:	3R Silica Gel	Į
Final Wt.	720	631	526		1/		8/5	
Initial Wt.	721	631	525				1842	
Net Weight	-/	0	1				26	
Description of Silica Gel Col- Filter I.D. No Description of Probe Rinse Col- Impinger Conte	or: .: Particula ntainer I.	ite on Fi	lter:	Percent Filter (	Container	l Marked/	Sealed: Y Sealed	<u>.</u> N
BLANKS: Probe	ringe:	* *	Impin	ger:		Filter:		-



### VELOCITY TRAVERSE DATA

SAMPLING LOCATION Transfer Point Bar Præs (in HG) 5-t/02 Pitot Type Post Leak Check Plant Litot No. Stack Diameter (in) City Pitot Cp CO2/O2 Analysis By 20.7/0 Operation Thermocouple Date TP-1 Post MEFASUREMENT DEVICE MJ-77-1 Run No. 1608 0700/070 Time Ts(DB) deg F Micromanometer Ts(WB) deg F Pg(in H2O) 10 ki.fanometer -0.24 -0.3087 Ps(in HG) 0.0 CO2.% 0.0 Magnachelic 20.9 02 % 20.9 Delta P Delta P Ts point | Delta P Ts port Otherr 0.131 10.1124 Explazia: <u>30°</u> 0.127 1111.CM 0.11731 10.1027 TIRAVERSE SCHEMATIC 3Ò 0.1197 10.1126 30 0. 1238 1 U.1392 <u>30</u> 10.12491 10.1398 30 0.0912 10.1046 130 16.1138 10.1250 130 0.1311 10.1439 30 11247 0.1384 130 0.1235 10.1336 130 10.1358 10,12091 130 Ps == Pbar + Pg/13.5 Moisst(%) = 100(3%)Md = 0.44(%CO2) + 0.32(%O2)+ 0.28(%N2 + %CO) Ms == Md(1-Bws) + 18Bws 10.35 hort Average  $Vs == 85.49Cp(sq\pi[(Dolta P)avg])$ Moist (%)  $x \operatorname{sqrt}[(Ts + 460)/MsPs)]$ Moist (Bws) Md(lb/lbmole) Qa = 60Vs.AsMs(Ib/Ibmole) IVs (fus) Qs = Qa[528/(Ts + 460)](Ps/29.92)Qa (ac(m) x (1 - Bus) Qs (dsc(m)



PAGE 1 of 3

	SIAMETER O.265	K FACTOR	SAMPLE TRAIN (In 1.9) (In 1.9) (In 1.9) (In 1.9)
AUN NUMBEH	NOZZLE NUMBER DIÁMETER O.265	CO2 CONTENT	TEMP (deg. E) 56 54 56 54 56 54 56 54 56 54 56 56 56 56 56 56 56 56 56 56 56 56 56
AUN N	NGTH R TYPE	D2 NTENT	ILEMPER CHELL CHEL
Z A	PROBELENGTH AND LINER TYPE 4' 76 PLOA	LEAK CHECK GC A(FINAL)	OVEN GREATER COVEN
SAMPLE TYPE 201	PITOIT	LEAK CHECK (INITIAL)	TEMP (deg. F)
2	STACK ID (In.)	-	STADIK (deg. F) 15.00
SAMPLINIS LOCATION	FILTER NUMBERS	STACK PITOT NO.	delta H
SAMPLIN Transfe	AMBIENT TEME (deg. F)	O H O	Usititi P VELOCITY HEAD (Int. H2D)  O. II della P
DATE 11-16		EACTOR (Y)	DGM HEADING Vinstell It.] BIO.881 BIS. 16 BIS.
	AMBIENT PRESS (In. Hg)	24.50 D@M H@ 1.841	CLOCK TIME (24/4)
NO CITY	4	DGM BOX No.	
PLANTAND CITY	OPERATOR	G #	TRAV:

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		SAMPLE	(lu: Hg)	[ع	F.		3	يًا ا	<u>M</u>	<u>E</u>	5	<del>ا</del> ع	<u>5</u>	- r	4 0	7	2	13.5	13.5	13.5 13.5	13.5	13.5	3	77				
	· .	VS XIV	TEMP. AC	V	<u> </u> 	+																   	1	-	- 10	4		Dafe
RUN NUMBER		26.3	(100 (100 (100 (100 (100 (100 (100 (100	7.7		- -	72	12	72	73	73	23	23		- 0	<u>-</u>		-	7	69	<u> </u> 	69	2	1	1,	7 0\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	DGM	
DH -		SHIGEL		77	2 3		44	49	50	50	3	2	7 2		20	50	51:	15	50	05	50	2	7 4	1/2	-	c		υγ:
IYPE		Helien			2-	$\frac{1}{1}$							-  -	<u> </u>						-		-	-	+	<u>-</u>	7		Shoot Chocked Uy:
SAMPLETYPE	<u> </u>	<u> </u>		7	2-						-		-	1	_					-	-					- <del> </del>		<i>મે</i> ક
NOIN			STACK	- -	20	52	ų.	2 6	50	27	00		24	50	55	56	5.2	7.4		50	10 /	57	52	50	55	20	STIK	_
SAMPLING LOCATION		る (なれ)	DINISOE		49.0																	1	<u> </u>				II AVG	_
SAMPL		7 SAS 7		(02) (02)		\																					AVG:SQL11	
DATE	-	11-11							. 9	62	6		9				7			00			22	48	6	980	USM VOLUME	
		atte	CAS METEN	χ	815.56	0 0 /8	0 200	873.42		887.6	886.41	891. 12	895.39	899.67	904 0	2 0 0	708,12	912.31	916.12	970.68	924.89	929.07	933.2	937.	941			
Janon		/Charle	oLocik	24-lir)		<u>                                      </u>	1			_	1315	-				-	_ <u> </u>	1415						15.15	- 2121			
28110 CHYVELTY		deside	ELAPSEU TEST 0		1	1	140	150	160	170	083	2	2 5		710	220	230	240	250	260	270	286	250		200	310	JVIOI IVIOI	
	-			INIO?	ál																			0	0	0 (	) <del>)</del> 0	special 7

EMISSION TESTING

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SALAPLE TUMIN ACUU (In: 11U) 7 I Uale неимиймвен AUX TEMP: 44 OGNO CGNO NOON NOON TONG TONG Q Ģ ھ SII, GEL IMPINGER TEMP (\* F) 4 5 Shoot Chucked BY FIETER S OVEN (EMP) SAMPLETYPE 2 alvat. Biological 200 AVG SHC F SAMPEING LOCATION STACK LEMP (CD) 53 56 I VVG 11 0111131GE (ht. 1120) 0.56 ING SOLI 1000st VELOCITY HEAD (HEAD) 1 ļ UGM VOLUME GAS METET HEADING Vm (II3) 51.VQ 455.306 5 ~ 950 954 GEOCK TIME (24-hi) Charlotte JUD GINV TRIVITI 8951 TOTAL 342:2 (Infu) 330 340 1 8 Vulcan THAV POINT 0 Q b 0 0

<u>(</u> €00

## VELOCITY TRAVERSE DATA

SAMPLING LOCATION Transfer Point Bar Press (in HG) Pitot Type Post Leak Ch∞k Pizat Pitot No. Stack Diameter (in) City 0.84 Pitot Cp CO2/O2 Aralysis By\_ Operatorator\_ Thermocoupis ME MEASUREMENT DEVICE Run No. 0708 Time 32... Ts(DB) deg F Micrommometer Ts(WB) deg F 30 --3015 -.3244 Pg(in H2O) 10" Mandanometer Ps(in HG) CO2.% 0.0 Magnarmahalia 20.9 02 % Dolta P Ts Delta P Ts point | Delta P गरुता Other or 0.1353 10.1115 Explain:aini 0.1287 10.1128 0.1062 10.1196 B.1349 10.1444 10.13<u>47</u>1 10.1452 10.1420 0.1349 10.1191 1 (2.133) in. 1146 0.1478 10.1369 10,1310 10.1377 0.1299 10.1416 0.1319 10.1433 Ps = F = Pbar + Pg/13.6Moist: ist(%) = 100(3ns) $Md = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CO)  $Ms \Rightarrow = Md(1-Bws) + 18Bws$ -qπ*Q3*63 sqrt 5970.361 Average Vs = -85.49Cp(sqn[(Dolta P)avg])x sqrt[(Ts + 460)/MsPs)]Moist (%) Moist (Bws) Md(lb/lbmole) Qa = = 60Vs.4sMs(lb/lbmole) IVs (ft/s) Qs = Qa[528/(Ts+460)](Ps/29.92)Qa (aclm) x (1 - Bus) Os (dsc(m)



PAGE 1 of

RUN NUMBER SAMPLING LOCATION SAMPLE SAMPLING LOCATION SAMPLE TYPE

	NOZZLE NUMBER DIAMETER	Land of the land o
2	PROBELENGTH AND LINER TYPE H'TEPA	
201	Sp Cp	
1+	STACK (In) 12"	
GINSTEN BO. Nt	IT FILTER NUMBER	
	TEMP TEMP (dog. F	
36-CI-II	STATIC PRESS (in. Hg)	
1,440	AMBIENT PRESS (In. Hg)	
ALAN AND CITY	OPEHATOR BRIM	

<b></b>	- 6
KFACTO	
CO2 CONTENT	
52 CONTEN %	
LEAK CHECK (FINAL) I' O.OOSC	
LEAK CHECK (INITIAL) C.ocs CL	
OBSAT	
STACK PITOT NO:	
STACK THEHM NO.	
DGM GAL FACTOR (Y)	
Wed Med	
BOX No.	
ABBUMED MOISTURE (%)	91

			1	-	_	- 1			<u>,</u>	1	Ī	Ī	_	_		<u> </u>				
SAMPLE TRAIN	2 A C	AL L	+	ړ_	_		5	_ کم	   t	\   	ا	-		ا ا		۲-	<u> </u>			٠
			85	6	64	67	66	1.6	: 5		7	H.	75	7.5	26	20	AVE	TEMP.	9.50	
SIL GEL IMPINGER	TEMP	(deg: F)	38	8 8	47	44	177	7,7	2	43	7	415	HH	777	177	TI				;
FILTER	TEMP	(deg.F)	NΔ	_						+			_		-	<u> </u>	*			
BEOHA	JEWB	(d 6ap)	γn	-	-			1				_		-		<u> </u>	*			_
STACK	теми	(deg. F)	35	27	2 2		3 5	27	26	56	24 24	55	65		3	200	70	AVE		21:6
la shale	OHFICE	(m. H2O)	35	2 2 2					ļ										della F	
della P	HEAD	III H201		10,0	+												<b>~</b>	AVE SQRT	celtair	
	PEADING	Vm (ci)	12 24 0 1 C	20.01	4.12.12	100 11 4833	48.1.34	991.54	995 64	499, 77	12021 60	15001	20,100		1015,115	10.9.95	102म. म्य	MOG	VOLUME	153 427
	CLOCK		(diring)	1923														100000		
CELAPSED	TEST		(MIN)	0	9	20	30	Ott	3 5	1			3	90	100	21	00	TOTAL	TIME	
	TANV.	- Z	S)	7						-	+					-	<u></u>	*		

EMISSION TESTING

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7.5 1.5 <u>फ</u> 1.5 7.5 SALAPICE TTAMIN ACUU (In: Hg) Ç C Γ C ι r Γ C Ľ C Ualo AUX. TEMP: (P. F) 12/2 HEUNINDER OCMG  $\mathcal{B}$ 28 7 20 ሯ 7 福 ğ 7 79 ב NOOM NOOM TEAP  $\omega$  $\tilde{\omega}$ ۲ 7 28 ď 7 **2** 48 49 ₹ 00-1 00 4 47 SIL GEL IGPINGEN TEMP 1 48 45 1 46 5 子 **₽** 46 46 45 45 Shoot Chocked Uy: CVEN CVEN TEMP SAMPLETYPE ₹ 2 इब्र P1000 1000 (F) 2 SIKC シス ב 70 46 30 52 55 STACK TEMP 51 49 47 700 7 7 42 0 64 50 58 57 Š SAMPLING LOCATION 970 0111110E (dit 1120) (6.0) IVOS SOLII VELOCUTY HEAD (bit 1(20) माव | SILVO 11-12-96 VOLUME GASMETER READING READING 11106.82 1028.32 1086.02 036.67 1045.00 1090.39 28.58 1102.69 040.83 082.16 1094.49 061.56 .49 10.8.04 1053.24 068.79 1049.13 265.65 1057.4 673.92 1032 Just lotte CLOCK TIME (24-fii) PILANT AND OTIC HINE TOTAL ğ ELAPSED TEST TIME TIME 200 300 30 320 220 270 130 9 200 240 260 210 5 Ŝ 130 250 150 50 140 ober 2 POINT NO: ı 0

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EMISSION TESTING

7.5 (h: 140) 5 ふ ζ Ualo (F) DGM F HUNNUMBER Media to  $\mathcal{S}$ <u>a</u> Sil, GEL MAPINGEN JEMI/ (°E) 43 25 52 52 Shoot Chocked By: OVEN TEAP TEAP ЗУМРЦЕТУРІЁ ENOME TEMP (F) SIIC F SPACK TEMP 54 53 54 SAMPEING LOCATION 义 99 1 ransfer from NVG 11 Oppurient (he 1020) 0.55 Avg sulli 10.14 VOLUME GAS/METETT (TEADING You'(13) 11-12-92 ואס 1128.968 115.06 1127.42 1110.94 1123.31 1119.18 malote GLOCK TIME (24=(b)) PLANT AND GUY JIVIII. 373.7 (opio) | 11851 | 1851 370 350 330 340 360 022 TTMV. POINT 7 Ø D

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DEECO

### VELOCITY TRAVERSE DATA

SAMPLING LOCATION Transfer Paint Bar Press (in HG) Pitot Type Post Leak Check Vulcan Plant : Pitot No. challotte Stack Dizmotor (in) City Pitot Co Operation Blown CO2/O2 Analysis By Thermocoupie Date = NIMEASUREMENT DEVICE Run No. **ለ** ገ20 Time Micromanometer Ts(DB) deg F Ts(WB) dog F 30 - 3 N2 Pg(in H2O) -0.2491 10" h Manometer Ps(in HG) 12.0 00 CO2 % Magagnehelic 20.4 20.9 02 % Dolta P Ţs Delta P point | Dalta P роп Otherer 6.1112 0.1163 A Expicizio: 0.1347 101186 0.1331 TTRAVERSE SCHEMATIC 10.1287 0.1461 0 1267 0.1321 10.1468 0. 12417 10.1293 1247 B 0.1533 10.1304 10.1577 10.1268 0.1402 10.1301 10.1337 10.1371 C. 1440 10.1363 <u>10. 1338</u> Ps = Pbar + Pg/13.6Moisist(%) = 100(3 ms)Md  $d = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CO) Ms s = Md(1-Bws) + 18Bwsgat -arto.332 52no.368 Ayerage  $V_{S} \approx 85.49 Cp(sqrt[(Dolta P)avg])$ Moist (%)  $x \operatorname{sqrt}(Ts + 460)/M:sPs)$ Moist (Buz) (slomdl\ci)bM Qz z = 60VsAsMs(lb/lbmola) √s (ít/s) Qs s = Qa[528/(Ts + 460)](Ps/29.92)Qa (ac(m) x(1 - Bws)

Qs (dsc(m)



PAGE 1 of 3

Ä		NOZZLE	NUMBER DIAMETER	0.265		2 KEAGTOR	ENT	1	1			ollo VAC	(deg. F) (m Hg)	49		52 7	+	56 7	76	61 7	-	7	65	-	1 20	7	FUE	T-MP.	
AUN NUMBER		PROBE LENGTH NO		D.,	601	02 02	CONTENT COL	555555	7.6	SILGEL		TEMP	(deg. F)	34	_	_	_ }				_	_	17	_	40 6		 	<u> </u>	]
SAMPLE TYPE	261	PROBE		17 - TO 1	0.0.14	HEAK   EAK		(FINAL)	0.005 @ 11 TO 00 5 c 11	HILTER	DECEMBER OVEN			_												1,	*		7
OCATION	2 Point	SILVE GIVACIE	ယ္	(11)	1 7		SIAUK PITOT ORSAL	ON			JUNES 11 1	Cellair State		324 334	$\perp$	200	30	27	122	2 7	40	77	42	777	197	1		AVE AVE. delta H TEMP.	10.1
SAMPI NISTOCATION	Transfer Point		AMBIENT FILTEM	(deg. E)	49 32		STACK S		,						0.128		1			1			-					AVE SORT -	
AAAHE AAAHE	11-13-96		T STATIO PRESS				DGM	CARL FACTOR (Y)	1 1.064			DGM	READIN	η (cg	129.	133.46	137.41	141.51	• • •	170	153		161.93	186.03	a).0L1	174.	31 178.44	DOM	1444 137
	Che, hate		AMBIENT	(in. Hg)	3.43	(B) 24.85	мөд мөд	BOX No. H@	MS-4 1.84		ELAPSED	TEST CLOCK	TIME	(MIN) (24-HIA)	C10	10	१	30	70		60 0831	20	80	90	100		120 093	TOTAL	- IME
	N JOAN TAND CITY	NACK AND	OPERATOR	ı	1700		ASGUMED	H H	<b>e</b>			TBAV.	POINT	NO	(												<u>با</u>	×	

Page 2 of 3

EMISSION TESTING

	SALIPLE ACUU (h: h)		7			7	<u>~</u>			~			[	7	7.5	2.5	7.5	7.5	13.5	- 1	1.5	u .	
•	AUX. TIL				<u></u> 		+								2					_	<b>-</b>		Dulo
nun numben 3	DGM IN/OUT TEAP	12	72	72	73	74	74	75	75	26	77	7	86	95	<u> </u>		18	 	1 28	קר (	8	PWENT HISTORY :	
1Uh	SII GEL MPINGEN TEMP	39	40	40	7	42	45	46	777	44	77	4	エコ	41	48	48	77	48	44	\$	20	; !	Uy:
YPE	PERIOD OF THE PARTY OF THE PART	1. V	2							-			-				-			<u> </u>	->		Shaal Chackad By:
SAMPLETYPE	ENOUE FINOUE		1							-	-	+	-	+	-				<del> </del>		1		
MOIN	STACK	(1)	7 7 7	17	L	122	45	177	غ د	7	12/2	3 4	<b>a</b> ;	2 4	5 3	מ ב	0	200	404	7	13	AVG STK F	
	1248/6/16	(021)	0.55																  - 			LI AVG	
SAMPL			80.0								1	<u> </u>	<u> </u>	<u> </u>	-\		-			0	-	AVG SQLII	
91.VQ	4.			73	2,	95	21	37	.52	93	87	21	되	28	37	.45	55	.64	248,79	7252.9	151.00	2(a) 1.1 DESM	VOEUME
	NSVE)	MIN VIII	182.56	186.73	190.90	145.05	199.21	203.37	207	211.	215.87	220.	224	228.28	232.31	236.	240.	244.69	248,	959	7	7	
Jano	Charlette	TIME (24-(II)	136	<u> </u>			1	1631	!					1131						123		:	····
ANT AND GIT	ISEU INSEU		130	140	150	160	100	180	190	200	210	220	230	740	750	260	270	280	290	300	310	370	TIMATE
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RUNNUUMBER  SEN INOUR  CES INOUR	98	_			<u> </u>						E NOW
PUNIN SILGEL INPINICER INFINICE INF	- 2				-						
	1 1 1			<u>                                     </u>							ckod Uy:
SETARRE OUSTAN CONSTRUCTION OUSTAN (CD)	2		1 1						<u>                                     </u>	1 1	Sheel Checked By:
SAMPLE TYPE  2 OF FIRETE TEMP ( D)	2										_
SATION	53										SIKE
□2 \	901										(L)
SAMPLING LOCATION  That text is sing sing sing sing sing sing sing s	250							+			AVG SQLIT
	9933				1 1			1 1	<u>                                     </u>	<u> </u>	
DATE LAS-46	(III) 265.28 31	001									VOLUME
GÁS!	Vin (II3) 256 265.2 269.31	273.									
Nortale Colock		2	<u>                                     </u>	1 1			<del>                                     </del>				
		1325	<u> </u>				<u> </u>			<u>                                     </u>	
PILANT AND GITY  ELANSED GLOCK  ELANSED GLOCK	330 340	3502									TOTAL
3	NO. NO.	->									00026
<b>一國乙</b>			<u> </u>			1_1_			1 1	<del>- 0'0</del>	<del>00</del> 0026

DESCO

# EPA METHOD 1 TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Valcas	
4016241/	
CITY Charlotte STATE DC	
SAMPLING LOCATION Transfer Point	
INSIDE OF FAR WALL TO OUTSIDE	
OF NIPPLE, (DISTANCE A) 12.11	
INSIDE OF NEAR WALL TO OUTSIDE	: [
OF NIPPLE, (DISTANCE B)	A
NEAREST UPSTREAM DISTURBANCE >2 34"	d 012
DISTURBANCE Bend	
NEAREST DOWNSTREAM DISTURBANCE >8 #174	
DISTURBANCE BENL	Fan
SAMPLER BRIM DATE WIR GL	SCHEMATIC OF SAMPLING LOCATION
11-10-013	DOTTEMATIO OF SAMPLING LOCATION

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	4.4	12	<u>'</u>		½ "
2	14.6		3/4"		34"
3	29.6		35"		35"
4	70.4		85"		85"
5	85.4	,	10 4 "		10 1/4 "
6	95.6	,	112"		11 1/2 "
			·		
			·		•
	٠,				
					1



## PARTICULATE/SAMPLE RECOVERY DATA SHEET

:cu =			-				1
ClDlient/Location:	Volcan	/Transfe	r Point	Sam	pling Dat	e(s): <u>#-1</u>	<u>/</u>
RURUN No.:	Reco	overy Date	:: <u>11−1¢</u>	<u>-96</u> R	ecovered 5	By: 6	Si lica Gel
Impingers: Final Wt.	100	95	D		1		216
Initial Wt.	100	100	0				167
Net Weight	0	-5.	0			<u></u>	1 49
Desescription of I Sililica Gel Color Fililica Gel Color Fililiter I.D. No.: Desescription of I Proprobe Rinse Continumpinger Content RUEUN No.: 2 Impingers: Final Wt. Initial Wt.	Particulate I.I contain	ce on Filt	er: NA	Percent S Filter Co Liqu	pent: ntainer I nid Level	95 .D.: S Marked/S Marked/S	ealed: Y N ealed: Y N ealed: Y N
. Net Weight						<u> </u>	
Desescription of Sifilica Gel Color Firilter I.D. No. Desescription of Prorobe Rinse Con Imampinger Conten	r: : Particula tainer I.	te on Fil	<u>-</u>	Percent Filter C	uid Level	75 I.D.:  Marked/S Marked/S	grams  Z  Sealed: Y N  Sealed: Y N  Sealed: Y N
RUEUN No.: 3	Re	covery Da 2	te: <u>////</u>	4	Recovered 5	d By:6	Silica Gel
Final Wt.	740	694	579				9/9
Initial Wt.	745	1694	578				1888
Net Weight	-5	10	1				31
DeDescription of SiSilica Gel Col FiFilter I.D. No DeDescription of PrProbe Rinse Co IsImpinger Conte	or:  Particul ntainer I nts Conta	ate on Fi	lter:	Percent Filter Li	Spent: _ Container quid Leve	70 I.D.: el Marked,	Sealed: Y N /Sealed: Y N /Sealed: Y N /Sealed: Y N
BLBLANKS: Probe	rinse:		Impin	ger:		LIT CETA	<del></del>



## VELOCITY TRAVERSE DATA

	SAM	PLING LOCATION	N	
	Vibrating	Scieen		- 1 - 1
	7	_	Bar Press (in HG)	29.70
ent Vulcan	Pitot Typ=		The Late Check	
ty charlotte	Pitot No.	011	Stack Diameter (in)	12'
20.72(OF BRIM	Pitot Cp	0.84	CO2/O2 Analysis B	y
11/18/76	Thermocuple	<del></del>	11-18-96	,
-		11-17-96	11 Prc/1	(25+/1
MEASUREMENT DEVICE	Run No.	Fan Check	0130	1704
·	Time	1645	54	
ficromanometer	Ts(DB) deg F	<u> </u>	149	1
	Ts(VB) deg F	<u> </u>		
O" Manometer	Pg(in H2O)	1	4618	4129
	Ps(in HG)	143	0.0	0.0
fagnehelic	CO2.5%	0.6	20.9	20.9
	02 %	1 20.9 Dola P 1 T		Delta P   Ts
other 🔽	nice neq	1. 200.00		1.0764 48
Explain:	A   1		.0833	1.0825
- ·	1 3	1.07	1.0951	1-110
TRAVERSESCHEMATIC	13	.10	.1130	-1121 48
	13	11 6		1.1211
	16	1.085	1.09941	1.1202
		065	1.0756	.0927
	BIL	1.07   5		1.07371 48
	2	1.09	1.0832	0718
	1 4		1.1189   52	1.1200
	15	1.095   5		.0996 48
			1.09901	1.0879
•	16	1.00		l l
	<u> </u>	_ <del></del>		
	<del>                                     </del>	<del></del>		
Ps = Pbar + Pg/13.6				
,	<u> </u>			
Moist(%) = 100(Bnz)				
			<del>-</del>	
Md = 0.44(%CO2) + 0.32(%O2)	·)		<del></del>	1
+ 0.28(%N2 + %CQ)	· <del></del>			8
1				
Ms = Md(1-Bus) + 18Bus			A. 120.097	
	<u> </u>	<u> </u>	mar 6.312	Sort
Vs = 85.49Cp(sqn[(Dolta P)avg	]) Avorago	50rt 0.289	1310.3121	
x sqrt[(Ts+460)/MsPs	)] <u>[Moist (%)</u>	!		<del>- i i i i</del>
	Moist (Bus		······································	
Qa = 60VsAs	Md(lb)bm			
	Ms(lb/lbm	ola) <u> </u>		<u> </u>
$Qs = Qz[523/(Ts \div 460)](Ps/29.$	92) Vs ([L/s]			
x (1 - Bws)	Qa (ac(m)			
1	Qs (dsclm	<b>.</b>	11 I	ş <u>1</u>



PAGE 1 of 3

		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
	E DIAMETER D. 265	K FACTOR
AUN NUMBER	NOZZLE NUMBER DIÁMETER 0,265	D2 CD2 SONTENT CONTENT % %
AUN NI		CEAK D2 CD2 CHECK CONTENT CONTENT (FINAL) % %
313	PHOBE LENGTH AND LINER TYPE 3' TARM	20000000
SAMPLE TYPE		CHECK CHECK (NITIAL) (FINAL)
50	*	ONSAT CI
SATION		
SAMPLING LOGATION	AMBIENT FILTER TEMP NUMBERS (deg. F) O16	STACK PITOT
SAMI V.bu.	AMBIENT TEMP (deg. F)	STACK THERM NO.
DATE 1-18-46	STATIC PRESS (In: Hg)	DBM CAL FACTOR (Y)
DATE 11-18-4	<u>'</u>	DC C FAC
#6	AMBIENT PRESS (In. Hg)	©H
AND CITY Charlette		DOM BOX No.
PLANT AND CITY	оренатон Вим	ABBUMED DAM MOISTURE BOX No.
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TRAIN VAC (in, Hg)	١٩	6,5	6.5	6.5	6.9	6.5	5.7	-	(	1	-	- 2	-		
DOM IN/OUT TrMP (deg. F)	3	१ %	0	63	65	3	52	80	000	0/	96	2		AVE. TEMP.	3.05
SIL GEL IMPINGER TEMP (deg. F)	45	157	12	7	47	77	707	707	7	200	3,	5	2		1 1 1 1 1 1 1 1 1 1 1 1
FILTER OVEN TEMP (deg F)	NA		<u>.</u>  -	-	-	-		\ - - - -	-			-	4		t t t
PHOBE TEMP (deg. F)	2		+		-				+		1		>		
STACK TEMP (deg. F)		49	5 5	3 3	35		7	7	2	70	52	53	સ	AVE.	51.6
delta H ORIFICE (In. HBO)														T AVE	
delta P VELOCITY HEAD (In, H2Q)	,०ववम														delia r
DGM HEADING Vm (cu. ft)	273,920	211.85	201.85	285.1	187.65	293.94	298.22	302.02	306.06	310.13	314.15	318.17	312.23	DGM	138.452
CLOCK TIME (24:HR)	3.5						0849						2619		
ELAPSED TEST TIME	C	2	20	8	710	8	00	<u> </u>	8	06	100	9	3 5	TOTAL	TIME
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200	<u> </u>	YEO IS	GAS METERS LIENDING	VELOCITY OF	DINIFICE LEMP		OVEN LEARP			in (1)	ACUU (In: 11g)
		24-(11)	<u>€</u>	0.044 0.044		<u>≋l</u> ≋l	AZ	51	72	NA	7.5
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	01	1237	342.37		53			2 2	300		7.6
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<u>~</u>	190		350, 40		C 4	2		52	1		7.5
<u>ત</u>	200		354.30		22	74	-	52	73		7.5
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<u>, , , , , , , , , , , , , , , , , , , </u>	230		566.30		200	10		52,	75		7.5
	240		370.23		5,	1-	-	5	22		7.5
• •	250		374.21		53	<u> </u>	-	15	6		7.5
- 4	260		378.21		52	1 -	<u> </u>	5	てて		7.5
	270		387.77		58	100	 	51	28		<u> </u>
	280		286.25		42	7	 	15	3		7.5
<u></u> 1	250		390,31		7	<u> </u>	-	7.	20		<u>د۔ ا</u>
	8	_	394.47		7	15	+-	3	1		7.5
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		AUX. TEMP:	<b>2</b> -	W11	-											    -								Web wat	์ ว
RUN NUMBER	7196	IN/OUT TEMP	100	$\frac{1}{a}$					Ì											-				NOG DGM F	
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	Sir GEL	SILCIEL IMPINGEN TEMP (F)	20	20		_	_	1	_	_			<u> </u>	<u> </u>	1	1	_	_ <u> </u>	<u> </u>		 	<u> </u>	<u>                                      </u>		By:
<u> IYPE</u>	Harit	OVEN TEMP ( F)	DA	MH																					Shaof Chackod Dy:
SAMPLETYPE	8	PRODE TEMP (-6)	7	BA													_								
NOIN		STÁCK TEMP	15	2																				AVG STK F	
SAMPLING LOCATION	2 - 1	)	0.51					_													,			AVG	
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DAIG	81-11	100000000000000000000000000000000000000																						DISM VOLUME	
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OF ANTI-AND CITY		I Arsed Test Tiest	80) 88)	1 .	<del>17.</del>	<del></del>																		NO TAL	
	Volcan,	1 * * LSSSSSSSS	884 861	2		1							<del>'</del>												Page Totals
			ာ <u></u> ၂	31 8	181	1	3	<u> </u>	<u> </u>	<u> </u>	!_	\			<u> </u>	.!	_!_		<u>!</u>		Ų	90	<del>-0</del> 4	<del>o d</del> 0	132



## VELOCITY TRAVERSE DATA

SAMPLING LOCATION Vibrating Screen 29.20 Bar Press (in HG) Pitot Typ= Vulcan Post Lask Chack Plant char lette Pitot No. Stack Diameter (in) City 0.84 Operation Black Pitot Co CO2/O2 Analysis By \_\_\_ Thamo∞upla 1- 19-96 Date Post/1 MEASUREMENT DEVICE Run No. 1410 Time Ts(DB) dag F Micromanomater | Ts(VB) deg F -0.4798 1-0.4231 Pg(in H2O) 10" Minnomotor Ps(in HG) 0.0 D.O CO2 % Magnebolic 26.9 20.4 O2 % Delta P Dalta P  $\overline{\mathrm{Ts}}$ leoint | Delta P ಾಂಗ Other 1007731 0.1488 Explaini 0.0761 10.0717 0.018 10.0744 0.0831 10-1159 0.0705 10.0990 10.0932 0.0791 0.1496 0.1433 0.1031 0995 n.0972 10.1101 0.0926 0,1091 0.0960 10,100 Ps = Pbar + Pg/13.5  $Moint(\%) = 100(3\pi s)$  $Md = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CQ) Aug AP .106 Ms = Md(1-Bws) + 18Bws0.1075 AVG AP ≈10.306 Average San Ø 326 Vs = 85.49Cp(sqrt[(Dolta P)avg])x sqrt[(Ts + 460)/MsPs)] Moist (%) Moist (Bus) Md(i5/i5mole) Qz = 50 Vs.4sMs(lb/lbmole) Vs (it/s) Qs = Qa[523/(Ts + 460)](Ps/29.92)Qa (aclm) x (1 - Bws) Os (dsc(m)

Defend

# METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 3

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	NMETER	0.365	KFACTOR		ı		SAMPLE	TEAIN	Ş	(E)	p	ω	00	90	Ø	(T)	<i>S</i>	80	$\alpha$	$\sigma$	00	00	90			
RUN NUMBER	NOZZLE NUMBER DIAMETER	0	CO2	a a serende federal	0.0	1	S WOO				55	59	63	63	65	۲9	89	989	69	66	60	10	_	AVE.	TEMP.	64.6
RUN N		۲	00	CONTENT CONTENT	20.4		SIL GEL	IMPINGER	JEMP.	(deg. F)	49	17	41	46	40	10	50	8	15	52	53	53	53			
ad.	PROBE LENGTH AND LINER TYPE	3. Terlan	AVE I	OHECK.	(FINAL)	2000	FILTER	OVEN	dMH.	(deg. F)	47 		-			-	  -  -	_				-	>			
SAMPLE TYPE	PITOT C	0.84	- CHAIN		(INITIAL) (HINAL) 70.4	800		PHOBE	TEMP	(deg. F)	L)A	_									-	-	<u> </u> -		333 <b>333</b>	:
Z S	N.	L C		OHSAT	SN SN			STACK	TEMP	(deg. F)	53	2.7	53	200	52	744	74	22	200	3	1/2	3 5	7 2	) ) ()	TEMP	9
SAMPLING LOCATION	FILTER	004		STACK PITOT	NO.			Aladia til			-	2													Avi: della H	
SAMPLING!		deg. Fl		STACK	ÖN	,			VELCAN		3	2007		1			+				-	1	+	>	AVE SUM:	-
DATE	STATIC A		(8V -: 4231	DGM	FACTOR (Y)	1.004			DOM	HEADING	Tal lon La		21.712	421.17	425.25	429.24	.1	437.17	441.23	445.30	449.32	453.36	451.38	`~. 1	DOM	Crie design
	AMBIENT		l	Wed ⊞@	<u>)</u>	1.841			CLOCK	TIME	(24-111)	1 मा		,				0843						0943	no Stelo	
AND CITY Charlatte	¥ .			DOM	 31 40 81	N5:4		ELAPSED	TEST	HME	(SIIN)	٥	9		\$	70	50	90	סר	8	90	201	110	130	TOTAL	TIME:
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The color	9	•	Charlotte			200	1.0000	เลเกเล	SILGEL	DGM		SAMPLE
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EMISSION TESTING

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-	AUX. TEMP.			-											<u> </u>			 	3 1
HUNNUMBER	DGM INOUT	15	36															AVG DGM F	
INDU C	SILGEL SILGEL MANGEN II TEMP		56																
VI9E	OVEN TEMP	NA N		<del> </del>															Shoot Chocked Dy:
SAMPLE 1YPE	Profit Profite	<u> </u>		<del>-&gt;</del>			-											2000001	 Shoot
30000	- XX	881 881	63															SING SING	
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Clirk	Chrilette O clock	(24-lii)	1342			<u> </u>				 				_					
PI ANT AND GIT	ELAPSEU HESTE	(min) (6	330	<u>                                     </u>														TOTAL	
	o <b>4 / 1</b> . w/2000	. <u>.</u>	<u>~</u>	->												00	0 0		) <b>3</b>



## VELOCITY TRAVERSE DATA

	S.	4MP	LING LO	CATION	<u> </u>			
Ī	Vibrating	Su	een_					
	3					***	29.15	
	Pitot Typ=		<u> </u>		Bar Press (in	HU), .		
city charlotte	Pitot No.				Post Leak Ci	ices.	12_	
OCCUPIENT RPAIM	Pitot Cp		0.824		Stack Diama	ter (m) Joseph Dec		
Date N-20-96	Thermo∞up	ls			CO2/O2 A.r.2	п <b>?22 р</b> У		
	·				11 12 01/2			<del>'</del>
MEA SUREMENT DEVICE	Run No.		(re/3		1805¥3	<del></del> .		
	Time	}	0715		1332		<u>,</u>	
	Ts(DB) dag		<del></del>		<u>                                     </u>		<u> </u>	-
	Ts(WB) dog		100		11 -2 22 72		<u> </u>	
10" Mamometer	Pg(in Fi2O)		-0.459	6	1 5.3972		<u> </u>	
	Ps(in HG)				<u> </u>	·	<u></u>	
Magneinelie	CO2 %	- 1	0.0		10.0	<del></del>	<u>r</u>	
	02 %	!	20.9		20.9	Ts -	Doltz P I	
Other	port les	int ]		Ts	Dolta P I	12	1001211	<del></del>
Explain:	<u> </u>		0.1013	52	0.0737		<u> </u>	<u> </u>
1 1 1 Data Molti Metel			0.0001		0.0757	·	<del></del>	<del>  </del>
TRAVERSESCHEMATIC	->  _		0.0815		0.0767	··		
	1 4		0.007	<del></del>	0.0994	<del></del>	3 1	
	1 5	5	0.0940		0.0926		1	
			0.0821		10.0169		<u> </u>	
}	13	_	0.0971		0.0746		3	<del>-</del>
1			0.0921		6.0701		<u> </u>	<del></del> }
			10.0812		10.07291		<u> </u>	
		4	0.0955	1	16.1153		<u> </u>	
	<u> </u>	<u>5</u>	0.0855	<u> </u>	<u> 6.04  </u>		<u> </u>	
•		6	60187	1.4	16.6903		1	
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			R	<u> </u>	ll		<u> </u>	
			8	<u> </u>				<u> </u>
	7		Ŋ.	<u> </u>			_ 1	!
$Ps = P^{*bar} + Pg/13.5$		•	ĥ	<u> </u>	<u> </u>		1	<u> </u>
10 10 10 10 10 10 10 10 10 10 10 10 10 1			B	1		ļ		<u> </u>
Moist(%) = 100(3%)			1	1		<u> </u>	<u> </u>	
11021, 101 - 100(2.10)			1		1	1	<u> </u>	<u> </u>
$Md = 0.44(\%CO2) \div 0.32(\%O2)$	<del>                                     </del>		1	i -			į į	1
÷ 0.28(%N2 ÷ %CQ)	+ 1						<u> </u>	1
(0.50(70.12 , 7000))	<u> </u>		- <u>i</u>	1		Ι_	8	1
Ma = 1444 Due) & 18Bne	\ <del>-</del>		- <u> </u>	- <del>}</del>			8	
Ms = Md(1-Buz) + 18Buz	Ava	ΔP	10.089	<del>-</del>		i	8	1
No - 25 400-((/Dalia Plane))	Average		Sort	10.298	her!	Ī	क्रवत	:
$Vs = \frac{25.49 \text{Cp}(\text{sqrt}[(\text{Dolta P})\text{avg}])}{25.49 \text{Cp}(\text{Sqrt}[(\text{Dolta P})\text{AsPs}))}$	Most (%	<del>,                                    </del>	<b>→~~~</b>	10,4,0		<del>i</del>	i i	1
x sqrt[(Ts+460)/MsPs)]	Moist (By		<u>.</u>	<del></del>		<u> </u>	<u> </u>	1
0 50/54	Md(ib/lb			<del></del>	<del></del>	·	1	<u> </u>
Q2 = 60VsAs			· -			+		<del></del>
0. 0.0000000000000000000000000000000000	Ms(lb/lbr	11015	<u> </u>	<del>- 1</del>	<u>'</u>	1	<del></del>	1
Qs = Qs[523/(Ts + 460)](Ps/29.92)			<u></u>			1	<u>ŧ</u>	¦
x (1 - Bwz)	Q2 (25fm		- <u>R</u>			¦	<u> </u>	_;
	Os (dscf:	:11	Į.	1	11	1	3	1



PAGE 1 of 3

	E DIAMETER 0.265	K F# 3TOR	SAMPLE CLL LLC CL LCL
AUN NUMBER	NOZZLE NUMBER DIAMETER	CONTENT %	NOUT TEMP.
AUN 1	ENGTH H TYPE		Sili Gall Manvaen (deg, F) (
TYPE	PROBE LENGTH AND LINER TYPE 3' 7CF CM	LEAK CHECK (FINAL)	OVEN Gen (deg F)
SAMPLE TYPE 2C1 A	ритот Ср <b>0.8</b> 4	CHECK CHECK (INITIAL)	HEORIG (Guide HEAVIOR
NO S	sryck ID (In)	Orisa7	STAGE TEMPS STAGE TEMPS STAGE TO STAGE
SAMPLINIS LOCATION	FILTER NUMBERS OIL	STACK PITO'I NO.	delta H  delta H  delta H
SAMPLI	AMBIENT TEMP (deg. F)	STACK TPIERM NO.	daltu P VELOCITY HEAD 0.0815 0.0815 AVE SQR1 delta P
DATE 11-20-96	STATIO PRESS (in. Hg) -0.4546	D'GM CAL FACTOR (Y) 1.004	524.105 554.105 558.15 558.15 570.14 570.14 570.14 570.13 570.13 570.10 570.10 570.10 570.10
9	AMBIENT PRESS (In: Hg) 29.15	ром ⊩© 1.841	CLOCK TIME (24-HR)
PLANT AND CITY		DOM BOX No. MS-4	ELAPSED TIME (MIN)
PLANT	OPERATOR B&	ASSUMED MOISTURE (%)	1 2-1 2-2 3-2 4-2 4-2 4-2 4-2 4-2 4-2 4-2 4-2 4-2 4

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RUN NUMBER		NIOUTH (E)	67 K	67	1.9	68	28	3	96	20		0.0	73	2	1 22	7 6	7 7	74	77,		H :	7	75	DOM I	
NON Y	S   GF1	MPINGEN TEAR	74	3	$\mathcal{S}$	8	55	52	5,3	24	54	74	20	177	12	2 2	200	000	2 4	00 =	10,	53	53		by:
SAMPLE TYPE		COVEN TEMP	<u> </u>	-			<u> </u>					-  -  -	     	-		-  -  -				- <del> </del> -			<del>-&gt;</del>		Shoot Checked Dy.
		STACK ITYODE TEMIN	1 -	7	56	2/2	200	3 3	72	180	2 2		5	<del>ا</del> کا	100	09	200	1 - 6	9	1	9	99	10	AVG SIIC F	
	100 X 100 I	OBMPICE NE	<u> </u>	5		1 4	2 4		177	1			7 -											II II	
	<u>                                    </u>	VELOCITY HEAD	20.5	2.00																	·		>	AVG SQLII	
DAILE	11-20-46	GASMETER HEADING	(C))) (II)	=	_'I	01.	ار٥.	.05	=	00	0	=======================================	38	47	67	.02	101	.03	F .	670.20	7	80	1 =	DOME VOLUME	
II.X	]ww/offc			1	010.10	10 H	618.07	622.05	626.11	630.	634.01	638.11	641.98	645.47	649.97	654.02	658.01	662.03	666.17	229	674.12	1.28.08	283		
PLANT AND OTTY	J.	EARSED GLOCK TEST GLOCK TIME TIME	2001	130 0444	110	50	160	170	8	190	200	210	220	230	240	250	-360	\$ 210	280	240	1 &		200	TOTAL	
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	SAMPLE	ACUU ((In: Hg)		<u> </u>									<u> </u>	-		_		<u> </u>			1	1	-	÷ ;	2
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RUN NUMBER	Neg	INCOUR LEAR (F)	25-	2			- <del>-</del>													-			AVG	IXCM II	
HUN	77.17	(G) IME(I) UHBONIA/II	55								-													(e • •	
DE		OVEN IMP	AN A	<del>-</del>	<u> </u>			<u> </u>						.										:	Shoot Chockod Uy:
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SAMPLINGFOOCATION	Scien		0	<u>3</u>	1	-	<u> </u> 	<u>                                     </u>	\	<u> </u>					<u> </u> 		1	1	_				_	III	
IDILING	librating	C II Orninge	0.50	<del>-</del>	<b>≯</b>	<u> </u>	<u> </u>		1	<u> </u>	1	_	_	<u> </u> 	<u> </u> _	<u> </u> _	<u> </u>	_	<u> </u> 	<u> -</u>  -		<u> </u>   		TID.	
SAN	\d:\b	=	21800	+	->												_							AVG SOLLI 17	
DATE	11-20-46	GASMETELL	<b>3</b>	690.11	2.047																			VOLUME	
	046		8881 <u> </u>	99	250			_	<u> </u>	_			<u> </u>	1	<u> </u> 	1	<u> </u> 				<u> </u>	<u> </u> 	<u> </u>		
	みれつしゃり	CLOCIC	(24-lii) 1312		1327																				_
ZIIO CINVERNI SITE		ELAPSED TIEST TIME	(min) 330	340	- <del></del>			j																TUNE	
		TIVV.	<u> </u>	3																		00	9 0	000	) 14 C



# EPA METHOD 1 TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

PLANT Yulcan	
CITY Charlotte STATE 120	
SAMPLING LOCATION NO.	1200 -7
INSIDE OF FAR WALL TO OUTSIDE	
OF NIPPLE, (DISTANCE A) 12"	
INSIDE OF NEAR WALL TO OUTSIDE	·
OF NIPPLE, (DISTANCE B) -	
NEAREST UPSTREAM DISTURBANCE 32"	` 8 1 A
DISTURBANCE Bend	401
NEAREST DOWNSTREAM DISTURBANCE 386"	
DISTURBANCE Bend	11300A
SAMPLER BROWN DATE 11-18-91	\ FAN
DATE 11-18-96 [	SCHEMATIC OF SAMPLING LOCATION

TRAVERSE		1	PRODUCT OF .	·	
POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE B	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)
1	4.4	12"	٤ ".		2"
2	14.6		34"		34"
3	29.6		3 1/2 "		31/2"
4	70.4		81/2"		85"
_ 5	85.4		104"		101/4"
6	95.6	1	115"	.	
		<del>  </del>			113"
<u></u>				·	9
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<del>_</del> _		<del></del> !			



## PARTICULATE/SAMPLE RECOVERY DATA SHEET

Client/Location			<del></del> -		pling Dat		
RUN No.:	Rec	overy Dat	e: <u>  [[-[2</u>	3-96 R	ecovered 5	By: <u>2</u>	
Final Wt.	671	645	611				875
Initial Wt.	659	639	602				835
Net Weight	12	6	9			<u> </u>	40
				Cotal Moi	sture = _	67	grams
Description of Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten	r: : Particulat tainer I.I	te on Filt		Percent S Filter Co	pent: ntainer I	.D.:S	
n	<b>D</b>		11-19	-96	Decemend	Du.	į Y
RUN No.: 2	Rec	covery Dat 2	3	4	5	6	Silica Gel
Final Wt.	677	645	614				1875
Initial Wt.	671	645	611				833
Net Weight	6	0	3				42
	-					<b>~1</b>	-
Description of Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten	r: : Particula tainer I.1	te on Fil	ter:	Percent S Filter Co	ntainer	I.D.: Marked/S	Sealed: Y N
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con	r: Particulation I.1 tainer I.1 ts Contain	te on Fil D.: ner: covery Da	ter:	Percent S Filter Co Liqu	pent:	I.D.: Marked/S Marked/S	Sealed: Y N
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten	r: :	te on Fil D.: ner: covery Da	ter:	Percent S Filter Co Liqu Liqu 4	pent: intainer lid Level lid Level	I.D.:	Sealed: Y N Sealed: Y N Sealed: Y N
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten  RUN No.: Impingers:	r: Particula tainer I.1 ts Contain	te on Fil D.: ner: covery Da 2	ter:	Percent S Filter Co Liqu Liqu 4	pent: intainer lid Level lid Level Recovered	I.D.:	Sealed: Y N Sealed: Y N Sealed: Y N Silica Gel
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten  RUN No.: 3 Impingers: Final Wt.	r: Particulation I.1 ts Contain	te on Fil D.: ner: covery Da 2	ter: te: <u>((-)</u>	Percent S Filter Co Liqu Liqu 4	pent: intainer lid Level lid Level Recovered	I.D.:	Sealed: Y N Sealed: Y N Sealed: Y N Silica Gel
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten  RUN No.: Impingers: Final Wt. Initial Wt. Net Weight	r: Particulation I.Its Contain Record 1	te on Fil D.: ner: covery Da 2 645	te: <u>(1-2</u> 3 614	Percent S Filter Co Liqu Liqu 4	pent: Intainer   Marked/S Marked/S By: 6	Sealed: Y N Sealed: Y N Sealed: Y N Silica Gel	
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten  RUN No.: Impingers: Final Wt. Initial Wt. Net Weight  Description of Silica Gel Colo Filter I.D. No. Description of	Particular tainer I.1 ts Contain Record 1 674 677 Impinger or:	te on Fil D.: ner: covery Da 2 645 645 Contents:	ter:	Percent S Filter Co Liqu Liqu 7 4 Total Mo: Percent S Filter Co	pent:	Marked/S Marked/S By: 6	Sealed: Y N Sealed: Y N Sealed: Y N Silica Gel Q\5 Grams grams x Sealed: Y N
Silica Gel Colo Filter I.D. No. Description of Probe Rinse Con Impinger Conten  RUN No.: Impingers: Final Wt. Initial Wt. Net Weight  Description of Silica Gel Colo Filter I.D. No.	Particular tainer I. Its Contain to Contain	te on Fil D.: ner: Covery Da 2 645 Contents: te on Fil D.: ner:	ter:	Percent S Filter Co Liqu Liqu 7 4 Total Mo: Percent S Filter Co	pent:	Marked/S Marked/S By: 6  I.D.: Marked/S	Sealed: Y N Sealed: Y N Sealed: Y N Silica Gel Q\5 Grams grams x Sealed: Y N



### VELOCITY TRAVERSE DATA

11.00

SAMPLING LOCATION Fines Crushed 29.70 Bar Prass (in HG) Pitot Typ= VULCAN Plant Post Loak Chook charlotte Pitot No. City 0.84 Smalt Diameter (in) Pitot Cp Operator BRIM CO2/O2 Analysis Sy 20.9 11-17-96 8111 ziquccomonī 11-18-96 Post MEASUREMENT DEVICE PR/1 Run No. 0731 Times 1705 Ts(DB) deg F Micromanometer Ts(WB) dag F -.41 Pg(in H2O) .41 10" Manometer Ps(in HG) CO2 % 0.0 Magnehelie 20.9 <u>02 %</u> 20.9 Dalta P I Delta P Ţς ipoint | Dalma P | Ts ಾಂಗ Other .1180 ... 135 50 Explaini .1353 . 1353 58 -14 51 .15 871 .187] 51 TRAVERSESCHEMATIC 59 2172 .2172 175 1733 A1733 57 145 51 18 57 *12*07 51 18 , 2202 62 41118 <u>56</u> . 11<u>5</u> .1118 10 52 56 12 .1304 ι2 56 1370 43 125 12 52 -1921 14 56 - 21 12027 .22 .2027 56 52 5 -165 2127 ·2127 55 52 215 Ps = Pvar + Pg/13.6Moist(%) = 100(3%) $Md = 0.44(\%CO2) \div 0.32(\%O2)$ + 0.28(%N2 + %CO) Ms = Md(1-Bws) + 18Bws10.167 AVG DP 0.765 13:10,406 Average VAP 100 10.392 Vs = 85.49Cp(sqn[(Dolta P)avg])Moist (%) Moist (Bus) عـ4.5√s = 50 Md(lb/lbmole) (slomdi\di)zM Qs = Qa[528/(Ts + 460)](Ps/29.92)[Vs (ft/s) 21.94 Qa (acfm) 17326.2 x (1 - Bus) Qs (dsc(m) 12327.9



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SAMP (N)	BIENT MP	7
FINE	MBIENT FEMP deg. F1	52
FINIE	AMBIENT TEMP (deg. F)	25
FINE	AMBIENT TEMP (deg. F)	25
FING	AMBIENT TEMP (deg. F)	25
FINE	AMBIENT TEMP (deg. F)	25
SAMP	AMBIENT TEMP (deg. F)	25
SAMP 6 FINE		52
SAMP 96 FINE		25
11g samp	ATIC AMBIENT ESS TEMP Hg) (deg. F)	1 52
8/96 FINE		41 52
9ATE SAMP 1/8/96 FINE		41
1//8/96 FINE		-41 52
11/8/96 FINE		-41
11/8/96 FINE		14-
2 II//8/96 FINE		14-
VC 11//8/96 FINE		14-
NC 11/8/96 FINE		14-
5 NC 11//8/96 FINE		14-
LE NC 11//8/96 FINE		79.50 -41 52
LE NC 11/18		14-
NEVILLE NC 11/18	AMBIENT STATIC PRESS PRESS (In. Hg) (in. Hg)	14-
NEVILLE NC 11/18	AMBIENT STATIC PRESS PRESS (In. Hg) (in. Hg)	14-
NEVILLE NC 11/18	AMBIENT STATIC PRESS PRESS (In. Hg) (in. Hg)	14-
NEVILLE NC 11/18	AMBIENT STATIC PRESS PRESS (In. Hg) (in. Hg)	14-
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<b>ром</b> Н@ FA	M5-6 1.816 1.008	
DGM H@ FA	8001 9181 9-5W	
DGM DGM II BOX Nb, H@ FA	8001 9181 9-5W	
DGM DGM II BOX Nb, H@ FA	8001 9181 9-5W	
DGM DGM II BOX Nb, H@ FA	8001 9181 9-5W	
<b>ром</b> Н@ FA	8001 9181 9-5W 2	
DGM DGM II BOX Nb, H@ FA	% M5-6 11.816 1.008	
NUMED DOM DOM STUHE BOX No. H@ FA.	8001 9181 9-5W 1.008	
DGM DGM II BOX Nb, H@ FA	1% M5-6 1.816 1.008	

	SAMPLE	HAIN	VAC	(in, Hg)	Ģ	6.5	6.5	7	7	7	7	7	7	7	7	7	7			
	DGM	HON	TEMP	(deg, F)	29	29	64	65	99	67	89	69	$\mathcal{R}$	22	72	74	74	AVE	TEMP.	70.0
	SIL GEL	MPINGER	TEMP	(deg. F)	48	47	47	84	65	64	20	20	49	49	49	51	25			
@8%	FILTER	OVEN		(deg, F)												///				
101		PHOBE	TEMP	(deg. F)	]-											$\wedge$				
		STACK	TEMP	(deg. F)	53	53	54	54	54	54	55	55	25	55	26	55	55	AVE.	TEMP.	48.2
		della H	ORIFICE	(In. H2O)	0.48		- 1									///	1	AVE		0.48
	deltaP	/ELOCITY	недр	(In. H2O)	9.0	0.14	0, 14	"	0.16	"	6.19	"	0.20	"	0.78	"		AVE SORT	deltaP	
		DGM	HEADING	Vm (cu. ft.)	377.238	<del>382.8</del> 381.50 0.14	382.87	385.36	388, 25	389,92	394,13		400.57		407.10		413.251	pēm ,	VOLUME	214.77
		CLOCK	TIME .	(24-MR)	8:38AM			:							-				20200	
	ELAPSED	TEST	TIME	(MIN)	0	1.0	13:40	20	27:30	30	45:10	20	58:15	02	74:35	08	90:15	TOTAL	TIME	0.08/
		THAV.	POINT	NO	A-1	"	A-2	"	A-3	"	A-4	1	A-5	//	A-6	"				

TESTING
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D DATA

PLANT AND GITY		CITY		DATE 11/8/95	SAMP	SAMPLING LOCATION	ATION 7	SAMPLE TYPE	7.5BIO	)H / #	RUN NUMBER /	-	
ELAPSED	7007	633333	/ 📖			7/2/2	<b>1</b>		FILTER	SIL GEL	00000		SAMPLE
TRAV. TEST CLOCK POINT TIME TIME NO. (mln) (24-th)	94496900000000		GAS HE. YI	GASMETER READING Vm.(II3)	VELOCITY HEAD (in: H20)	ORIFICE (In. H20)	SIACK TEMP	TEMP ( P)	OVEN TEMP	IMPINGEH TEMP (*F)	TEMP (F)	AUX. TEMP.	ACUU (fr. Hg)
0			4/3.	251		0.48	53	1	)	20	į	l	7
01			417.	25		_	53			75	75		7
8-2 12:30,10:27	10:27		4/8	25		_	54			23	99		7
20 12:27 B	(17:71) (17:71)	7	1421, 2	67			55			15	89		7
8-3 25:20	<u> </u>	$\overline{}$	423,4	(7			55			15	02		/
30 -13.20	97.61-		425.3	34			55			15	70		7
R 4 38:40			428.	83			55			25	72		7
<b>€</b> 08	G 9		433.	46			55			23	73		6.5
-5 55:30		_	١,٠	19			55			54	X		7
1			1	43			58			55	75		2
R-6 72:50			442.(	19			25			54	75		7
80			945.	27		V	95	<b>^</b>	×	54	7%	>	7
END 87:45			449.	059					-		1		
							,						
		_											
TOTAL		1000,000	]	DGM	AVG SORT	AVG	AVG				AVG PGM F		
Page Totals		<u> </u>				<b>\$</b>							
	j	j						Sheet (	Sheet Checked By:			Dale	

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# VELOCITY TRAVERSE DATA

	SAM	PLING LOCATION	4	i i
Ī	Fines Ca			
_			- " "	
	Pitot Type		Bar Press (in HG)	
city chastate	Pitot No.		Post Lask Chook	· · · · · · · · · · · · · · · · · · ·
Operator Blam	Pitot Cp	0.84	Stack Diameter (in)	<del></del>
Dats 11-19-96	Thermo∞uple		CO2/O2 Analysis By	
	Run No.	R10 2	1801/2	
· · · · · · · · · · · · · · · · · · ·	lime	0138	1439	
	Ts(DB) dag F			
	Ts(W3) dog F		<u> </u>	
	Pg(in H2O)	<u> </u>	-0.3403	<u> </u>
	Ps(in HG)	1-0.3974		0
	CO2 %	0.0	<u> </u>	<u> </u>
	02 %	20.9	_	
Otherr i	pon jeeint	Dolta P   Ts	Delta P   Ts	Dolta P Ts
Expissini	A-1 _	1.1488   5	10.15111	<u> </u>
Air Data Meter	2   3	1.1436	0.1268	
TITRAVERSESCHEMATIC	3	1.1675	10.1728	
	4	1.2079	0.18241	
	5	1.2379	10.18171	
	70	4.1611	ا ١٦٦٤ ا	1
	BI	1 12/06	10.1118	¥
	2	1.1286	10.1411	1
	3	1.1603	0.1687	
	H	1.1972	0.1826	
	5	1.1980	0.2094	1
	6	1.663	10.1982	1
	1	1.1000	10.14001	
	<u> </u>		<u> </u>	<del></del>
	<del></del>	<u> </u>	<u> </u>	0 1
	<u> </u>	1		<u> </u>
		<u> </u>		<u>1</u> 1
Ps == Pbar + Pg/13.6		<u> </u>		1:
1	ļ	<u> </u>		
Moisst(%) = 100(3 %s)				_!!
		<u> </u>		
$Md := 0.44(\%CO2) \div 0.32(\%O2)$		<u> </u>		
÷ 0.28(%N2 ÷ %CQ)	<u> </u>	<u> </u>	<u> </u>	<u> </u>
		A 1	1	<u> </u>
Ms = Md(1-Bws) + 18Bws				R 1
( , , , , , , , , , , , , , , , , , , ,		i -		1
Vs = 85.49Cp(sqn[(Dolta P)avg])	Average	tort	50.407	Sort
x sqri[(Ts+460)/MsPs)]	Most (%)	<del></del>		
7.54.4(15.1405)/11.2515)]	Moist (Bus)			
Qz = 60VsAs	Md(ib/lbmaic	<u> </u>		
1 - 0013F2			<u> </u>	1
0= -0:53010 +4:0030 -50:00	Ms(lb/ibmola	<u> </u>	<u> </u>	<u> </u>
Qs = Qa[528/(Ts + 460)](Ps/29.92)	Vs (i vs)	<del>-{</del>		<u>-</u>
x (1 - Bnz)	Qa (acim)			
]	Qs (dstlm)	χ 1	11 1	R I



# METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 2

	E DIAMETER	0234	K FACTOR		1		SAMPLE	THAIN	OX.	(in, Hg)	9	9	9	9	Q	9	9	9	Q	9	و	9	و			
RUN NUMBER Z	NUMBER D		CO2	GONTENT CONTENT	0		MOG	NOUT	TEMP	(deg. F)	64	65	67	69	69	70	20	71	72	73	73	H	74	AVE	75	
#	ENGTH :H TYPE	TEFLON	02	CONTENT %	20.9		TED TIS	IMPINGER	TEMP	(deg, F)	Š	20	51	52	52	53	53	53	54	54	54	25	26		1	
2.5410 um	PROBE LENGTH AND LINER TYPE	4,7E	LEAK	CHECK (FINAL)	0.004	@ 14"	наглы	OVEN	TEMP	(deg. F)	(											1/	$\Lambda$	•		
SAMPLE TYP	PITOT	0.84	LEAK	CHECK	0.005 (4)	///		PHOBE	TEMP	(deg F)		_	_									11	1			
R	Ø	,,8/		OBSAT NO	1			STACK	TEMP	(deg F)	55	55	55	56	56	26	56	56	56	56	95	57	22	AVE. TEMP	9	503
SAMPLING LOCATION	FILTER	7100	STACK	PITOT				delta H	OHIFICE	((LH H)20)	0.48					_			-				<b>&gt;</b>	AVE della H	0.48	
FINES	AMBIENT TEMP (deg. F)	58	STACK	THERM NO.			delta P	VELOCITY	HEAD	(III. H2O)														AVE SORT		
DATE 11/19/96	STATIC PRESS (in, Hg)	-0.40	DGM	CAL FACTOR (Y)	1.008			DGM	HEADING	Vm (cu ft)	447.628	453.70	457, 75	460.99	465,84	469.89	472.11	477.93	7	484.15	420.06	494.13	497.58	DGM VOLUME	145.334	
E, NC	AMBIENT PRESS (In. Hg)	29.20	MOO	H@	1.816			CLOCK	TIME	(24-FIE)	7:48AM															
PLANT AND CITY	<u> </u>		Мва	BOX No.	M5-6		ELAPSED	TEST	TIME	(NIM)	5	0)	20	28:00	40	B	55:35	20	08	85:20	100	0)	118:30	TOTAL	358.50	
VVCCAN-	OPEHATOR	BHR	ABSUMED	MOISTURE (%)	1.4%			TEAV.	POINT	Q.	7-1	*	*	A-2			A-3	,	ł	A-4	"	>	A-5			

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VELOCITY NET OF THE STATE OF TH	SOC. 26 SOC. 2	CLUCK CAS METER TIME 502.26 502.26 519.32 11.12	Soc. 14/0 Soc. 14/0 Soc. 14/0 Soc. 16/0 Soc. 16/0
--	---	---	--

																•	
		SAMPLE TRAIN ACUU (in. Hg)	6.5	5'9	6.5	1											<u> </u>
		AUX. TEMP.	1			>											Date
RUN NUMBER		DGM IN/OUT TEMP ( D	18	82	28												AVG DGM_F
HUN	7#	SIL GEL IMPINGER TEMP (-F)	56	57	55	1											
TYPE	810 pm	FILTER OVEN TEMP (F)				>											Sheet Checked Br.
SAMPLE	201A 2.5	PHOSE OVEN TEMP ( P)	<u> </u>			>			-		<u>.</u>				 		Sheet C
and the state of	3	STACK TEMP (F)	29	29	29	)				 							STIC F
SAMPLING LOCATION		H ORIFICE (hr. H20)	0.48	_				•									AVG
SAMP	fC f	VELOCITY HEAD (in, H20)	3														AVG SORT
DATE	61/11	AS METER HEADING Vm (113)	767	58875	18.265	594,962											DGM NOLUME
ND CITY	NEVILLI	CLOCK TIME (24-hr)															
PLANT AND CITY	1/d - N	ELAPSED TEST TIME (min)	145:40	091	170	175:20	358:30										TOTAL
	VVCCF	TRAV. TEST CLOCK G POINT TIME TIME	8-6	1	1	END	TOTAL: 358:30							_			Page Tolals



# VELOCITY TRAVERSE DATA

	SAN	apling <u>lo</u>	<u>CATION</u>	<del></del>			
Γ	Fines G	108her					
<u></u>						76 15	1
iani Volcan F	itot Type		,	Bar Press (in	HG)	24.13	<del>"</del>
	itot No.			Post Leak Ch	cck .		
Charlotte F	Pitot Cp	0.84		Stack Diamet	cr (iii)	18	· · ·
Date 11-20-96	Chermocuple			CO2/O2 Ana	lyzis By		
Date	•	. ,		a		<del></del>	1
MEASUREMENT DEVICE	Run No.	IFC -3 PK	E	11×1543		<u> </u>	
MINISTER 12	Time	0723		1 Ptde			
	Ts(DB) deg F			1		<u> </u>	'
	Ts(WB) deg F					<u> </u>	· · · · ·
. — .	Pg(in H2O)	i i	*			1	
	Ps(in HG)	1-0.3931	<del>')</del>	-0.356	<u> </u>		<u>.</u>
	CO2.%	10				ì	
	02%	20.9		209		R S	
. —			Ts	Delta P I	Ts	Delta P I	Īs
Other	7		53	10.1320		1	:
Explain:	A 1	0.1080				i i	
	12	0.1445	<del> </del>	0.1433	<u> </u>	<del>- </del>	
TRAVERSESCHEMATIC	3	10.1541	<del> </del>	6.1280		<u> </u>	
•	<u> </u>	10.1768	<u> </u>	0.1457	<del></del>	8	<u> </u>
	1 5	10.1858	<u> </u>	1419		1	-
	16	10.1420	1	0.1345		- K	
	B 11	0.1006	0.65				
	2	10.124B	B-124	. C.1249		<u> </u>	<u> </u>
		10.1463	<u> </u>	15,13121			<u> </u>
	14	10.1552	\	0.1859			<u> </u>
	5	10.2022	<u> </u>	. 0.1988		<u> </u>	!
	16	10.1504	1.	10.1636		<u> </u>	
		6			_	<u> </u>	<u> </u>
	<del></del>	1	<u> </u>			1	<u> </u>
		6	<del></del>		1	9	T
	<del></del>		<del>-                                    </del>	<u> </u>	1	1	
		R	<del></del>		1	A	
Ps = Pbar + Pg/13.6	<u>                                     </u>	P	<del></del>		i		
	<u> </u>	<u>_</u>	<u> </u>		<del></del>	<del></del>	<del>-   -   -   -   -   -   -   -   -   -  </del>
Moist(%) = 100(Bus)					<del>`</del>	¥	1 _
		<u> </u>			<del>!</del> -		
$Md = 0.44(\%CO2) \div 0.32(\%O2)$	<u> </u>				<del> </del>	<del>\</del>	_
+ 0.28(%N2 + %CO)	<u> </u>				<del> </del>	<u> </u>	
,							
Ms = Md(1-Bws) + 18Bws	7				<u> </u>	<u> </u>	
1113 = 1115(1 5 115) 1 1 1 1 1	W	> 10,198	'		1	<u> </u>	
Vs = 85.49Cp(sqn[(Dolta P)avg])	Average	-απ <i>0.3</i> 8		hart		þ-grt	
x = 83.43  Cp(sqrt(DCtalr)avg) $x  sqrt((Ts+460)/MsPs)$	Moist (%)	1 1.0.30	<del></del> -		<u> </u>		
x 2dr.f( (224400))(4:212))	Moist (Bw	<u></u>		<u> </u>	T	N. T.	
60.5.4					*	<u>-</u>	1
Qa = 60Vs.A.s	Md(lb/lbm			<del></del>	<del></del>	- k	<del>-i-</del> -
	Ms(1b/1bm	1010)			<del></del>	v v	<del>-                                    </del>
Qs = Qa[528/(Ts + 460)](Ps/29.92)		1 77 7	54				
x (1 - Bws)	Qa (aclm)					<u>U</u>	
1	Qs (dscfn	12269	ステー	11	1 _		<u> </u>



# METHOD 5 TESTING FIELD DATA SHEET

PAGE 1 of 3

	NOZZLE NUMBER DIAMETER  0.234	KFACTOR	SAMPLE TRAIN VAC (in, Hg)	90		مصر	ه ه	00	9	ve	90	
AUN NUMBER	NUMBER D	CONTENT CONTENT % % % %		53	6	09 44 A	99	2000	89	69	1/2	AVE TEMP.
#3 H3	PROBELENGTH AND LINER TYPE  4'TERUN	02 GONTENT %	SIL GEL IMPINGER TEMP (deg. F)	50	200	25/2	52	53	54	20 c	55	
2.5410	AND LINER TYPE  4'TEFUN	LEAK CHECK (FINAL)	OVEN TEMP (deg. F)	1 -		++		-		+		•
SAMPLE 201A	PHOT Op 0.84	LEAK CHECK (INITIAL) 0.005@	PROBE TEMP (deg F)	) -				-		-		
NON	STACK ID (In.)	OPREAT	STACK TEMP (deg F)	50	20	122	521	7	55	55	56	AVE
EINES CRUSHER	FILTER	STACK PITOT	della H ORIFICE (in H2O)	0.47							>	AVE delta H
FINES	AMBIENT TEMP (deg. F) 50	STACK THERM NO.	della P VELOCITY PIEAD (In. H2C)									AVE SORT delta P
96/02/11	STATIC PRESS (In. Hg) -0.39	DOM CAL PACTOR (Y) 1,008	DGM READING YM.(cu.ft.)	595 <u> </u> 599.0	68.209		יוי יוי	626,68	╽┷╅	638,58	,  ~ ]	DGM VOLUME
E, NC	AMBIENT PRESS (In. Hg) 29,15	рам н© 1.816	CLOCK TIME (24-HR)	7:36AM								
CAN - PINEVILLE, N		DOM BOXNO M5-6	ELAPSED TEST TIME (MIN)	10	25:40	40	55:15	28	85:50	110	06:811	TOTAL
VVCAN -	оренатон ВНК	ASSUMED MOISTURE (%)	TRAV. POINT NO.	A-1	// A-2	"	A-3	"	A-9	*	A-5	

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Page 3 of 3

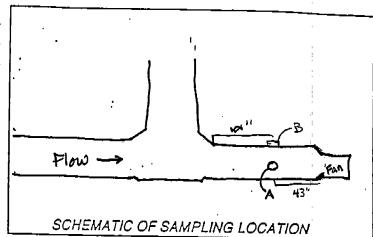
		SAMPLE TRAIN ACUU (In: Hg)	1	1	7								_			j 	
В.		AUX. S. TEMP. ( )	\-			///	Α.										
RUN NUMBER		DGM IN/OUT TEMP ( F)	22	66	29		-					,					AVG DGM F
IÙH	#3	SIL GEL IMPINGER TEMP ("F)															
TYPE	5410	FILTER OVEN TEMP ( F)	1			//	$\lambda$	*.									
SAMPLE TYPE	201A 2.5&10	Phobe TEMP ( P)	} -			1									-		
ATION	-	'ACK EMP ED	29	79	79												AVG STK F
SAMPLING LOCATION	MINES CRISHER	H ORIFICE (in: H20)	0.47	,			W										AVG EI
SAMP	T																AVG SORT
DATE	NC 11/20/96	GAS METER READING Vm (113)	727.38	732,26		739,624											DGM
NDCITY	EVILLE	GLOCK TIME (24-hr)	H7:55	09/	061	1:52Pm 178:10	359,83										
PLANT AND GITY	VVCAN -PINEVILLE	A PSEZ TA				1:52Pm	1										TOTAL
	WCA	TRAV. POINT NO.	8-6	*	*	END	TOTAL										Page



# EPA METHOD 1 TERT. & FINE TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

\*\* SAME DUCT FOR TERT. & FINES CRUSHER JLAR DUCTS BR 11/20/96

_
PLANT <u>Vulcan Materials</u>
CITY STATE A)
SAMPLING LOCATION CRUSHER
INSIDE OF FAR WALL TO OUTSIDE
OF NIPPLE, (DISTANCE A)
INSIDE OF NEAR WALL TO OUTSIDE
OF NIPPLE, (DISTANCE B)
NEAREST UPSTREAM DISTURBANCE 101"
DISTURBANCE T
NEAREST DOWNSTREAM DISTURBANCE 43"
DISTURBANCE Flage
SAMPLER BOM DATE 11-10-96



TRAVERSE		<del></del>		<u>;                                      </u>	
POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3 (TO NEAREST 1/8-INCH)	DISTANCE	TRAVERSE DISTANCE FROM OUTSIDE OF NIPPLE
-	<u> </u>			L L L	
1	4.4	18."	34,"	_	34"
2	14.6	<u> </u>	2 5/8		2 <sup>5</sup> 8" .
3	29.6		2 3/8 · · · · · · · · · · · · · · · · · · ·		5 36"
4	70.4		12 %		12 5/8"
5	<i>8</i> 5.4		15 5g		15 3/8"
6	95.6	V	17 4		17 "4"
<u> </u>				tink in the same same sale	
	<u> </u>	_	· ·		•
		<u> </u>			
<u> </u>					
					\ \frac{1}{2}



# PARTICULATE/SAMPLE RECOVERY DATA SHEET

Client/Location.	Fines	Crushe	es .	Sem	pling Date	(s): <u>[[-[</u>	B/11-20
			- - 11-18				
	nec	. 2	3	4	5	6	Silica Gel
Final Wt.	754	714	578				854
Initial Wt.	682	712	-15338				838
Net Weight	72	2	5				16
URATION TO USE	DINSTE	AD		Total Moi	sture =	95	grams
Description of I	mpinger C	Contents:	<u> </u>				<del></del>
	-		<del></del> ;	rercent s Filter Co	ntainer I	.D.:	
Description of I	Perticulat	e on Filt	er:			Se	ealed: Y N
Probe Rinse Cont	tainer I.I	).:		Liqu	id Level	Marked/Se Marked/Se	aled: I N aled: Y N
Impinger Content	ts Contair	ner:		ride	ITO PEACE.	Mar wedy o	
_				. 61		- 5	21.
	Rec	overy Dat	:e: <u>11-19</u>	75 I	lecovered 5	ву: <u></u>	Silica Gel
		4		<del></del>	<u> </u>	<u>-</u>	⊤∥
Finel Wt.	766	111	581		<u> </u>		884
Initial Wt.	754	714	578			<u> </u>	854
Net Weight	8	3	3	1		<u> </u>	30
		·	<u> </u>	Total Moi	sture = _	43	grams
				Popoent S	Pent:	70	<del></del>
				Filter Co	ntainer I	.D.:	9
Description of	Particula	te on Fil					ealed: Y N
				Liqu	uid Level	Marked/S	ealed: Y N
Impinger Conten	ts Contai	ner:		prd	ard Dever	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
2						_	
	Re					BA:	Silica Gel
	774			·	<del></del>	1	1076
Final Wt.	1 <del>-365-</del>	1640	T	<del>-</del>	<del>                                     </del>		0/0
Initial Wt.	766	111	1581				1844
Net Weight	8	-71	170			<u> </u>	32
				Total Mo	isture = [	39	grans
Description of				<u> </u>	isture = _	-7 A	grams
Silica Gel Colo	or:			Percent	Spent:	70	grams
Silica Gel Colo Filter I.D. No	or:	<u> </u>		Percent		70 I.D.:	grams Z Sealed: Y N
Silica Gel Colo	or: .: Particuls	ite on Fi		Percent Filter C	Spent:ontainer	70 I.D.:	Sealed: Y N Sealed: Y N
Silica Gel Colo Filter I.D. No Description of	or: Particulantainer I.	ite on Fi		Percent Filter C	Spent:ontainer	70 I.D.:	Sealed: Y N
	RUN No.: Impingers: Final Wt. Initial Wt. Net Weight  VRATION To USE  Description of I Silica Gel Color Filter I.D. No. Description of I Probe Rinse Content  RUN No.: 2 Impingers: Final Wt. Initial Wt. Net Weight  Description of Silica Gel Color Filter I.D. No. Description of Silica Gel Color Filter I.D. No. Description of Probe Rinse Con Impinger Content  RUN No.: 3 Impingers: Final Wt. Initial Wt. Initial Wt. Initial Wt.	RUN No.: Rec Impingers: 1  Final Wt 754  Initial Wt 682  Net Weight 72  Description of Impinger 6 Silica Gel Color: Filter I.D. No.: Description of Particulate Probe Rinse Container I.I Impinger Contents Contain  RUN No.: Rec Impingers: 1  Final Wt 766  Description of Impinger 6 Silica Gel Color: 1  Net Weight 8  Description of Particular Probe Rinse Container I.I Impinger Contents Container I.I Impingers: 1  Final Wt Rec Impingers: 1	RUN No.:  Impingers:  Final Wt.  Initial Wt.  Net Weight  Description of Impinger Contents: Silica Gel Color: Filter I.D. No.: Description of Particulate on Filter Probe Rinse Container:  RUN No.:  Impingers:  Final Wt.  Initial Wt.  Net Weight  Description of Impinger Contents:  Silica Gel Color: Final Wt.  Initial Wt.  Net Weight  Description of Impinger Contents:  Silica Gel Color: Filter I.D. No.: Description of Particulate on Filter I.D. No.: Description of Particulate on Filter I.D. No.:  Description of Particulate on Filter I.D.  Recovery Date of Impinger Contents:  Silica Gel Color: Filter I.D. No.: Description of Particulate on Filter I.D. No.: Description of Particulate on Filter I.D.: Impinger Contents Container:  RUN No.:  Recovery Date of Impinger Contents:  RUN No.:  Recovery Date of Impinger Contents:  RUN No.:  Impingers:  Recovery Date of Impinger Contents:  Run No.:  Recovery Date of Impinger Contents:	Final Wt.  Net Weight  Net Weight  Nescription of Impinger Contents:  Silica Gel Color:  Filter I.D. No.:  Description of Particulate on Filter:  Probe Rinse Container I.D.:  Impinger Contents Container:  RUN No.:  Impingers:  Final Wt.  Net Weight  Description of Impinger Contents:  Silica Gel Color:  Final Wt.  Net Weight  Description of Impinger Contents:  Silica Gel Color:  Filter I.D. No.:  Description of Particulate on Filter:  Probe Rinse Container I.D.:  Impinger Contents Container:  RUN No.:  Silica Gel Color:  Filter I.D. No.:  Description of Particulate on Filter:  Probe Rinse Container I.D.:  Impinger Contents Container:  RUN No.:  Silica Gel Color:  Filter I.D. No.:  Description of Particulate on Filter:  Probe Rinse Container I.D.:  Impingers:  1 2 3  Final Wt.  Final	RUN No.: Recovery Date: 11-18-46 R Impingers: 1 2 3 4  Final Wt. 754 7/4 578  Initial Wt. 682 7/2 5533  NRATION To USED INSTEAD  Description of Impinger Contents: Filter I.D. No.: Filter Container I.D.: Liquid Run No.: 2 Recovery Date: 11-19-96 Run Value of Filter I.D. Not Weight B 3 3  Final Wt. 766 717 581  Initial Wt. 766 717 581  Description of Impinger Contents: Filter I.D. No.: Percent S Filter I.D. No.: Liquid Run No.: 2 Recovery Date: 11-19-96 Run Value Recovery Date: 1 2 3 4  Final Wt. Recovery Date: 3 581	RUN No.: 1 Recovery Date: 1-12-46 Recovered Impingers: 1 2 3 4 5  Final Wt. 754 714 578 Total Moisture = 1-15	Recovery Date:   1-16-46   Recovered By:   886   Recovered By:   1   2   3   4   5   5   6   6

### APPENDIX F.

# LABORATORY SAMPLE ANALYSIS SHEETS

performed by DEECO INC. 3404 Lake Woodard Drive Raleigh, North Carolina 27604 919-250-0285

Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM 2.5 Filter	GA2
	Back-half Filter	·
Filter container number	004	
Date and time of wt	Gross wt 0 /02 6  Gross wt 0 /02 3  Gross wt Gross wt 6  Gross wt 6  Gross wt 70 /02 5	
	Tare Weight of particul	e wt of filter
Total weight of particulate	0.0352 + 0.0728 +	0.0006 = 0.1086
		weight of acetone used be subtracted

Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	410 PM 10 > PM 2.5 Ruis	e teflentopes teflentope
Acetone (PM <sub>2.5</sub> >x)	LPM 2.5 Rensie	+ efter tape
	Front-half Acetone less than 10 micron and greater than 2.5	i micron)
Front-half acetone container number and time of wt BAQ Date and time of wt BAQ Date and time of wt BAQ Date and time of wt BAQ	1-21-96 1116 11-22-96 2125 11-23-96 1704 11-26-96 2002	Gross wt 3.9374 1 Gross wt 3.9375 1 Gross wt 3.9306 1 Gross wt 3.9305 1
		Tare wt 3.8 578 etone blank 3
	Acetone Rinse (less than 2.5 micron)	
Back-half acetone rinse addated Acetone rinse volume (V <sub>a</sub> w) _ Acetone blank residue concentr	ration (C)	
W. = C.V.w = ( Date and time of wt	11-7.1-96 11-7 11-22-96 2-12 1 11-23-96 1707	Gross wt 3.6626 Gross wt 3.6610 Gross wt 3.6607 erage Gross wt 3.6609 wt of beaker 3.6603
W. = C.V.w = ( Date and time of wt	11-7.1-96 11-7 11-22-96 2-12 1 11-23-96 1707	Gross wt 3.6626 Gross wt 3.667 Gross wt 3.669

Plant Air Control Tech/Vulcan Sample Location Relative Humidity	Charlott	e, NC	Run Number <u>TL-2</u>
Sample Type	Sample lab	el name	Liquid level marked and/or container sealed
Back-half Filter	L PM	a.s F.:  ter	un
Date and time of wt	1458 1510		Gross wt 0 . /0 6 3 Gross wt 0 . / 0 6 0 Gross wt
Date and time of wt			Gross wt 0./06 Z

Signature of analyst \_\_\_\_ Signature of reviewer \_

elative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse $(PM_{10} > x > PM_{2.5})$	L10PM10 > PM2.5	Rense treflen tape treflen tape
Acetone (PM <sub>2,5</sub> >x)	LPM 2.5 Rense	teflen tape
(les	Front-half Acetone s than 10 micron and greater than	n 2.5 micron)
ront-half acetone container numl	ber 5827 80m	, <u> </u>
Date and time of wt DT 11-	21-96 1117	Gross wt 3.4874 g
	-22-96 2126	Gross wt 3.6855
<del></del>	1-23-96 1459	Gross wt 3.6839
Date and time of wt BAD	11-26-96 2006	Gross wt 3. 6842 1  Average Gross wt 3. 6841
		Average Gross wt 3.6841  Tare wt 3.5926
	Wt c	of acetone blank
		iculate in acetone 0.0915
	Acetone Rinse	
	(less than 2.5 micron)	·
Back-half acetone rinse authorities	container number 5846	
Acetone rinse volume (V,w)	35 ML	n
Acetone blank residue concentrat	tion (C)	n
	( ) (	) =
	-21-96 1115 22-96 2109	Gross wt 3.4342
	4L-96 4/09	Gross wt 3. 43 43
Date and time of wt BAN 11-		Gross wt 3 43 47
Date and time of wt BAD #- Date and time of wt BAD  -	23-96 1634	Gross wt 3.4342
Date and time of wt BALD //-		Gross wt 3.4342  Gross wt 3.4343  Average Gross wt 3.4343
Date and time of wt BAD #-	23-96 1634	Gross wt
Date and time of wt BAD 11-	13-96 1634 T	Gross wt  Average Gross wt  3.4343  are wt of beaker  3.43/9
Date and time of wt BAD 11-	73-96 1634 T	Gross wt  Average Gross wt  3.4343  are wt of beaker  3.4319  of acetone blank
Date and time of wt BAD #-	13-96 1634 T	Gross wt  Average Gross wt  3.4343  are wt of beaker  3.4319  of acetone blank

been analyzed, but has been archived.

Signature of analyst

Signature of reviewer

Plant Air Control Tech/Vulcan	Charlotte, NC	Run Number 7 6-3
Sample Location		
Relative Humidity		<u> </u>
Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter		
	Back-half Filter	
Filter container number 0/8	<u></u>	
	_	•
Date and time of wt _////9/96	1457 BAJ 1508 BAJ	Gross wt 0./00 3 g
Date and time of wt 11/20/96	1508 BAW	Gross wt 0.1000 g
Date and time of wt		Gross wt g
Date and time of wt		Gross wt g
	· · · · · · · · · · · · · · · · · · ·	Average Gross wt 0./002 g
	Та	re wt of filter 0.0655 g
	Weight of partic	
Total weight of particulateO, a	0347 + 0.0866	+ 0.0032 = 0.1245 g
		<u> </u>
\ <u></u>	lue > 0.01 mg/g or 0.001% of the	e weight of acetone used be subtracted
from the sample weight.	•	
Remarks		
	12/	
Signature of analyst	Saltaca Della	<u></u>
Signature of reviewer	Ninna last	

	MPLE ANALYTICAL DATA FORI	Run Number <u>TC-3</u>
Plant <u>Aircontrol Tech/Vulcan</u> sample Location	Charlotte, NC	_ Run Number
ample Location		
	-	
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	L 10 PM 10 > PM 2.5 Bail	tofler tape
Acetone & (PM <sub>2.5</sub> >x)	4 PM 2.5 Rense	tefler tape tefler tape
(less tha	Front-half Acetone an 10 micron and greater than 2.5	micron)
Front-half acetone container number	5838 100 m	L
Date and time of wt DI 11-21-		Gross wt 3.7697 g
Date and time of wt BAQ 11-2-2		Gross wt 3.7662 g
Date and time of wt BAQ 11-23	-96 \$1652	Gross wt 3 76 63 g
Date and time of wt	<del></del>	Gross wt g
	Avera	age Gross wt 3.7663 g
	We of one	Tare wt
	Weight of particulate	
		e in acetone <u>O, O&amp;&amp;</u> g
	A A To *	
	Acetone Rinse (less than 2.5 micron)	
	(less than 2.5 interoil)	
Back-half acetone rinse and the con	tainer number 584/	
Acetone rinse volume (V <sub>*</sub> w)	25 mL	ml.
Acetone blank residue concentration (		ml
$W_{\bullet} = C_{\bullet}V_{\bullet}w = ( ) ($	) ( )=	
Date and time of wt 11-2	1-45 114	Gross wt 3. 730 Z g
Date and time of wt $\cancel{BAQ}$ 11: 2-2	2-96 211 <u>3</u> 3.96 1619	Gross wt 3.727/ g Gross wt 3.7268 g
Date and time of wt <u>BAD //-23</u> Date and time of wt	):16 1014	
Date and time of wt	Aver	rage Gross wt 3 7270 g
		t of beaker
•	·	
	Wt of ace	etone blank
	Weight of particulate in aceton	
from the sample weight.	due >0.01 mg/g or 0.001% of the wenter that 10 micron aceters.	_
The state of the s	21 0	

Sample Type	Sample label n	ame	Liquid level container se	marked and/or aled
Back-half Filter	4PM 2.	5 F.: Her	yes	
	Back-l	nalf Filter		
Filter container number	<u> </u>			
Date and time of wt 1 1 19 9 6 Date and time of wt 1 1 20 196 Date and time of wt	1507 BA		Gross wt_ Gross wt_ Gross wt_	0.0829
Date and time of wt		- Av	Gross wt _erage Gross wt	0.0827
		Tare Weight of particul	wt of filter	0.0692 0.0135 BAD
Total weight of particulate	.0135 + 0	1.0416 +0	).0032 ±	- <del>0-05</del> 0.0583
Note: In no case should a blank res from the sample weight. Remarks	sidue >0.01 mg/g o	or 0.001% of the v	weight of acetone	used be subtracted

Plant Aircontrol Tech/Vulcan	Charlotte, NC	Run Number TP-/
suble rocation		
elative Humidity		<del></del>
G	5 1111	
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	LIOPM 10 7 PM 2.5 Rns	teflen tope teflen tope
Acetone (PM <sub>2.5</sub> >x)	L PM 2.5 Rusie	teflen tape
(less the Front-half acetone container number Date and time of wt DAL 2119 Date and time of wt DAL 1654 Date and time of wt	11-23-96 11-23-96 Avera	Gross wt 3.9359 g Gross wt 3.9330 g Gross wt 3.9324 g Gross wt g Gross wt g Tare wt 3.89/2 g tone blank g
Back-half acetone rinse	40mL	mL.
Date and time of wt $\overrightarrow{BAQ}$ //- $\overrightarrow{BAQ}$ //- $\overrightarrow{BAQ}$	) ( ) = 1-94 1(19 2-96 2116 13-96 24/622 6-96 2048 27-96 1315 (3.4446) Aver	Gross wt 3.4493 g Gross wt 5.4458 g Gross wt 3.4452 g Gross wt 3.4452 g
	Wt of ace Weight of particulate in aceton	etone blank g e rinse (m,) O·OO 32_ g
from the sample weight.	2	one rinse fraction. It has not
Signature of analyst	Denna Terhox	

Plant Air Control Tech/Vulcan			TP-2
Sample Location	·		
Relative Humidity	•		
Sample Type	Sample label name	Liquid level m container seale	
Back-half Filter	LPM 2.51	ilte ye	
		-	
	Back-half Filte	er e	
Filter container number 008			
The container humber			
Date and time of wt /1/19/96	452 BAL	Gross wt O	.0837 g
Date and time of wt /1 /9 /96 / Date and time of wt /1 /70 /96	1512- BAU	Gross wt	.0837 .0834 g
Date and time of wt		Gross wt	g
Date and time of wt		Gross wt Average Gross wt	<i>?∙0836</i> g
			-
	***	Tare wt of filter	0.0693 g
	Weight	of particulate on filter	0.0143 BH
Total weight of particulate	0143 + 0.03/1	+ 0.0001 = 0.	0455 g
Note: In no case should a blank resid	Jue $> 0.01$ mg/g or $0.001$	% of the weight of acetone us	sed be subtracted
from the sample weight. Remarks			
Signature of analyst	Balaca	Deween	
Signature of reviewer	Nune la	hy	

Plant Aircontrol Tech/Vulcar	n Charlotte, NC	Run Number 7P-2
Sample Location		
Relative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse $(PM_{10} > x > PM_{2.5})$	< PM 10 7 PM 25 Rrie < PM 2.5 Revie	telpe tage
Acetone (PM <sub>2.5</sub> >x)	LPM 2.5 Revie	tellor tape
	Front-half Acetone	
(less th	an 10 micron and greater than 2.5 m	nicron)
Front-half acetone container number		-
Date and time of wt $DT = 11-21$	5831 55 ML	
		Gross wt 3.5069 g
		Gross wt 3.5059 g
		Gross wt 3.5052 g
0. III 19HU 11-Z		Gross wt 3.5050 g
	Averag	ge Gross wt 3,505/ g
	314 6 .	Tare wt 3.4740 g
	Wt of aceto	
	Weight of particulate	in acetone <u>0 , 0 3//</u> g
Back-half acetone rinse and contactone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration (W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	$\begin{array}{c} & & & & & & & & & \\ & & & & & & & \\ C) & & & & & & \\ & & & & & & \\ & & & & & $	ne blank (2.000)
	S. Particulate III accione	mise (m <sub>s</sub> )
	ue > 0.01 mg/g or 0.001% of the weig	
Signature of analyst Signature of reviewer	Parkara Dewes	0000001

Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM 2.5 Filter	ys
	Back-half Filter	
Filter container number7	-P. 3	
Date and time of wt ///19 Date and time of wt ///20 Date and time of wt Date and time of wt		Gross wt
	Ta	are wt of filter  O.0697  culate on filter  O.0110
	0.0110 +0.272 + 0	0.0003 = 0.0385
Fotal weight of particulate		

Sample Location Relative Humidity    Sample Type
Acetone Rinse (PM <sub>10</sub> > x > PM <sub>2.5</sub> )  Acetone (PM <sub>2.5</sub> > x)  Front-half acetone container number Date and time of wt 1/22/96 Date and time of wt D
CPM 2.5   Combound   CPM 2.5   Combound   CPM 2.5   Combound   CPM 2.5   C
Front-half Acetone (less than 10 micron and greater than 2.5 micron)  Front-half acetone container number 585 / 60 m L  Date and time of wt 1//22/96 2/27 BAU Gross wt 3.7459  Date and time of wt Date and time of wt Date and time of wt Gross wt Average Gross wt 3.7458
(less than 10 micron and greater than 2.5 micron)  Front-half acetone container number
Tare wt
Acetone Rinse
(less than 2.5 micron)  Back-half acetone rinse training container number 5834  Acetone rinse volume (V,w)  Acetone blank residue concentration (C)
W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = (
Wt of acetone blank Weight of particulate in acetone rinse (m,) 0.0003
Note: In no case should a blank residue >0.01 mg/g or 0.001% of the weight of acetone used be subtracted from the sample weight.  Remarks This set of samples also included a greater than 10 micron acetone rinse fraction. It has not been analyzed, but has been archived.  Signature of analyst

Signature of reviewer

Plant Air Control Tech/Vulcan Sample Location	Charlotte, NC	Run Number	/5-l
Relative Humidity			
Sample Type	Sample label name	Liquid level marke container sealed	d and/or
Back-half Filter	< PM 2.5 filter	when	
	Back-half Filter		
Filter container number	6		
Date and time of wt	Gross wt	0667 g 0667 g g g 0667 g	
	Tare w Weight of particulate	ot of filter O. 6	0655 g 0012 g
Total weight of particulate OA	012 + 0.0084+	0.0009 = 0.01	05 g
Note: In no case should a blank residering from the sample weight.  Remarks	lue >0.01 mg/g or 0.001% of the we	ight of acetone used b	e subtracted
Signature of analyst Signature of reviewer	Barber Deliver		

Imple Locationelative Humidity		
		·
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse $(PM_{10}>x>PM_{2.5})$	L'IOPM 10 7 PM 2.5 R	ne telffex tape.
Acetone <b>Gabbles</b> (PM <sub>2.5</sub> >x)	LPM 2.5 Renie	teflox tape.
(less th	Front-half Acetone an 10 micron and greater than 2.	5 micron)
Front-half acetone container number	5862 90 m	-
Front-half acetone container number Date and time of wt 1/126/96	2329 BAD	Gross wt 3.9/27
Date and time of wt		Gross wt 3.9/27 Gross wt 3.9/28
Date and time of wt		Gross wt
Date and time of wt		Gross wt
****	Av	erage Gross wt 3.9/28
		Tare wt 3.9044
	Wt of a	cetone blank
	Weight of particul	ate in acetone 0,0084
	Acetone Rinse (less than 2.5 micron)	
Rank-half agetone rinse	(less than 2.5 micron)	
Back-half acetone rinse Con	(less than 2.5 micron)	
Acetone rinse volume (V_w)	(less than 2.5 micron)  Itainer number <u>5855</u>	
Acetone rinse volume (V,w)  Acetone blank residue concentration	(less than 2.5 micron)  ntainer number	
Acetone rinse volume (V,w)  Acetone blank residue concentration	(less than 2.5 micron)  ntainer number	=
Acetone rinse volume (V,w)  Acetone blank residue concentration	(less than 2.5 micron)  Itainer number	=
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ($ Date and time of wt $ V_*v  =  V_*v $	(less than 2.5 micron)  Italiner number $\underline{5855}$ $\underline{5m4}$ (C) $\underline{2321840}$	= Gross wt3. 58\$77
Acetone rinse volume ( $V_*w$ )  Acetone blank residue concentration $W_* = C_*V_*w = ($ Date and time of wt $ V_*  =  V_*v_*  =  V_*v_* $ Date and time of wt $ V_*  =  V_*v_*  =  V_*v_* $	(less than 2.5 micron)  Italiner number $\underline{5855}$ $\underline{5m4}$ (C) $\underline{2321840}$	= Gross wt 3. 58977 Gross wt 3. 58977
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt  Date and time of wt  Date and time of wt	(less than 2.5 micron)  ntainer number	Gross wt 3. 58977 Gross wt 3. 58977 Gross wt
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt  Date and time of wt  Date and time of wt	(less than 2.5 micron)  Itainer number	Gross wt 3. 58 977 Gross wt 3. 58 977 Gross wt Gross wt Gross wt
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt  Date and time of wt  Date and time of wt	(less than 2.5 micron)  Itainer number	Gross wt 3. 58 977 Gross wt 3. 58 977 Gross wt Gross wt Verage Gross wt 3. 58 77
Acetone blank residue concentration $W_{\bullet} = C_{\bullet}V_{\bullet}w = ( ) ($ Date and time of wt $\frac{1}{126}\frac{96}{96}$ Date and time of wt $\frac{1}{127}\frac{96}{96}$	(less than 2.5 micron)  Itainer number	Gross wt 3. 58 977 Gross wt 3. 58 977 Gross wt Gross wt Verage Gross wt 3. 58 77
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt  Date and time of wt  Date and time of wt	(less than 2.5 micron)  Itainer number	Gross wt 3. 58 77 Gross wt 3. 58 77 Gross wt 3. 58 77 Gross wt Gross wt Verage Gross wt 3. 58 77 wt of beaker 3. 58 6 % acetone blank
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt  Date and time of wt  Date and time of wt	(less than 2.5 micron)  Intainer number	Gross wt 3. 58 77 Gross wt 3. 58 77 Gross wt 3. 58 77 Gross wt Gross wt Verage Gross wt 3. 58 77 wt of beaker 3. 58 6 % acetone blank

been analyzed, but has been archived,

- андивание от истого

•	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM2.5 Filter	yes
	Back-half Filter	
Filter container number	<u>009</u>	
Date and time of wt 11/2-3 Date and time of wt 11/2-9 Date and time of wt Date and time of wt	1/96 2305 BAD	Gross wt
	Ta Weight of partic	are wt of filter 0.0673  culate on filter 0.0028
	n 0028 + 0 0166 + d	0.0011 = 0.0205
Total weight of particulate	0.00-21 0.0108 1 C	7.52.17

lant Aircontrol Tech	/Vulcan Charlotte, NC	Run Number <u>V5-2</u>
Imple Location elative Humidity		
Clative Hubbashy		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse $(PM_{10} > x > PM_{2.5})$	410PM 10 7 PM 2.5	felter reflex tope
Acetone (PM <sub>2.5</sub> >x)	LPM 2.5 Renzi	tetler seplen tope.
	Front-half Acetone (less than 10 micron and greater tha	n 2.5 micron)
Front-half acetone container r	number <u>5857 95 m</u>	
Date and time of wt 1126	96 23 35 BAD	Gross wt 3.4764 g
Date and time of wt <u>11/26</u> /	196 1252 BAD	
Date and time of wt		Gross wt g
Date and time of wt	<del> </del>	
	Wt	Tare wt 3.4598 g
		ticulate in acetone O.O/66 g
	Acetone Rinse (less than 2.5 micron)	
Back-half acetone rinse a	container number <u>5853</u>	
Acetone rinse volume (V <sub>w</sub> )		m
Acetone blank residue concer	ntration (C)	m
$W_a = C_aV_aw = ($ Date and time of wt $1/26$	196 2318 BAD	Gross wt 3. 96 40
Date and time of wt $\frac{7/729}{1/27/2}$		Gross wt 3. 9637
Date and time of wt	12 12 13	Gross wt
Date and time of wt		Gross wt
		Average Gross wt 3.96 39
		Tare wt of beaker 3.96 28
	weight of particulate in	acetone rinse (m <sub>s</sub> ) O· Oo//
from the sample weight.	Weight of particulate in	t of acetone blank acetone rinse (m <sub>s</sub> ) O· OO//
been analyzed, but has been		
	Z1	
Signature of analys		u
Signature of analys Signature of review		0000

Plant Air Control Tech/Vulcan Sample Location	Charlotte, NC	Run Number V5-3
Relative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM 2.5 F.1/ter	yr
	Back-half Filter	
Filter container number		
Date and time of wt 1/23/96  Date and time of wt  Date and time of wt  Date and time of wt		Gross wt 0.0692 g Gross wt 0.0692 g Gross wt g Gross wt g Gross wt 0.0692 g
	Tare Weight of particul	wt of filter
Total weight of particulate	.0014 + 0.0094 + 0	0.0015 = 0.0123 g
Note: In no case should a blank residered from the sample weight.  Remarks		weight of acetone used be subtracted
Signature of analyst Signature of reviewer	Bally Dec	Ive_

Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	410PM 10 > PM2.5	jetter teglen tape ie tegten tope
Acetone (PM <sub>2.5</sub> >x)	LPM 2.5 Ren	ie teften tope
	Front-half Acetone (less than 10 micron and greater th	
Front-half acetone container Date and time of wt ///22/0 Date and time of wt ///27/0 Date and time of wt	number 5844 70 n 196 2052 BAO 1322 BAO	Gross wt 3.72 642 g Gross wt 3.72 75 g Gross wt g Gross wt g Average Gross wt 3.7244 g Tare wt 3.7244 g
		t of acetone blank g articulate in acetone 0.0094 g
	Acetone Rinse (less than 2.5 micror	)
Back-half acetone rinse and Acetone rinse volume (V <sub>w</sub> ) Acetone blank residue conce W <sub>s</sub> = C <sub>s</sub> V <sub>w</sub> = ( Date and time of wt ///27 Date and time of wt Date and time of wt Date and time of wt	25 / entration (C)	mL   mI   mI   mI   mI   mI   mI   mI
	Weight of particulate in	3.5833 't of acetone blank g
from the sample weight.	lank residue >0.01 mg/g or 0.001% o	f the weight of acetone used be subtracted

Plant Air Control Tech/Vulca	n Charlotte, NC	Run Number FC-/
Sample Location		
Relative Humidity	· · · · · · · · · · · · · · · · · · ·	
Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	< PM2.5 Filter	لهجم
		<u> </u>
	Back-half Filter	
Filter container number O15	<u>.</u>	
The comment humber	<del></del>	
Date and time of wt _/1/23/96	2119 BAD	Gross wt O. 0704 g
Date and time of wt $\frac{11/291/6}{11/24/96}$		Gross wt 0.0705 g
Date and time of wt		Gross wt g
Date and time of wt		Gross wt g
	Α	verage Gross wt 0.0705 g
	Та	re wt of filter <u>0.0664</u> g
	Weight of partic	re wt of filter U. 0664 gulate on filter O. 004 g
	-	
Total weight of particulate	0.0041 + 0.0183 +	0.0010 = 0.0234 g
<u> </u>		
Note: In no case should a blank re	esidue > 0.01 mg/g or 0.001% of the	weight of acetone used be subtracted
from the sample weight.		
Remarks		
Signature of analyst	Balana Dewe	
Signature of reviewer	The Walley	

Plant Aircontrol Tech/Vulcan	Charlotte, NC	Run Number FC-/
Sample Location		
Relative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse	410PM 10 7 PM2.5 Pan	a Lalla land
$(PM_{10}>x>PM_{2.5})$	2/04/11 /0 / 4/11/11/3/14/14	+ 4fer roju
Acetone (PM <sub>2.5</sub> >x)	LPM 2.5 Rinse	e teflow tope teflow tape
	Front-half Acetone	
(less th	an 10 micron and greater than 2.5	micron)
Front-half acetone container number	5860 B5 ML	
Date and time of wt 11/26/96	<u>2057</u> BAO	Gross wt 3. 5512 .
Date and time of wt 11/26/96	13 17 BAD	Gross wt 3. 5512 g Gross wt 3. 550 7 g
Date and time of wt		Gross wtg
Date and time of wt		
	Avera	0 0 0 0
		7 - 7
	Wt of soat	
		one blank g
	Weight of particulate	in acetone <u>0, 0 /8 3</u> g
Back-half acetone rinse	Acetone Rinse (less than 2.5 micron)	
Back-half acetone rinse	(less than 2.5 micron)	
Acetone rinse volume (V,w)	(less than 2.5 micron)  tainer number5858  25 m —.	inl
Acetone rinse volume (V <sub>•</sub> w) Acetone blank residue concentration	(less than 2.5 micron)  tainer number	
Acetone rinse volume $(V_a w)$ Acetone blank residue concentration $W_a = C_a V_a w = ($ ) (	(less than 2.5 micron)  tainer number	m
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt 1   2   4   6	(less than 2.5 micron)  tainer number $\underline{5858}$ $\underline{25m}$ (C) $\underline{}$	Gross wt 3.71 93 g
Acetone rinse volume ( $V_a w$ )  Acetone blank residue concentration $W_a = C_a V_a w = ($ ) (  Date and time of wt $                                       $	(less than 2.5 micron)  tainer number	Gross wt 3.71 93 g Gross wt 3.7193 g
Acetone rinse volume (V <sub>w</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt                              Date and time of wt                          Date and time of wt	(less than 2.5 micron)  tainer number $\underline{5858}$ $\underline{25m}$ (C) $\underline{}$	Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g
Acetone rinse volume ( $V_a w$ )  Acetone blank residue concentration $W_a = C_a V_a w = ($ ) (  Date and time of wt $                                       $	(less than 2.5 micron)  tainer number $\underline{}$ $$	Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7193 g Gross wt g Gross wt g
Acetone rinse volume (V <sub>w</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>w</sub> w = ( ) (  Date and time of wt                              Date and time of wt                          Date and time of wt	(less than 2.5 micron)  tainer number $\underline{5858}$ $\underline{25m}$ $\underline{}$ (C) $\underline{}$ $\underline{2323}$ $\underline{60}$ $\underline{326}$ $\underline{60}$ Average	Gross wt 3.71 93 g Gross wt 3.7193 g Gross wt 3.7193 g Gross wt g Gross wt 3.7793
Acetone rinse volume (V <sub>w</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt                              Date and time of wt                          Date and time of wt	(less than 2.5 micron)  tainer number $\underline{5858}$ $\underline{25m}$ $\underline{}$ (C) $\underline{}$ $\underline{2323}$ $\underline{60}$ $\underline{326}$ $\underline{60}$ Average	Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7193 g Gross wt g Gross wt 3.7793
Acetone rinse volume (V <sub>w</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>w</sub> w = ( ) (  Date and time of wt                              Date and time of wt                          Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt g Gross wt 3.7/93 g of beaker 3.7/83 g 3.7/83 gao
Acetone rinse volume (V <sub>w</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>w</sub> w = ( ) (  Date and time of wt                              Date and time of wt                          Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7793 g age Gross wt 3.7793 g of beaker 3.7183 3AO tone blank
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt $   z  / g $ Date and time of wt $   z / g $ Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g age Gross wt 3.7/93 g of beaker 3.7/8/3 g 4.7/8/3 g 4.
Acetone rinse volume $(V_*w)$ Acetone blank residue concentration $W_* = C_*V_*w = ( ) ($ Date and time of wt $   z  / g $ Date and time of wt $   z / g $ Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7193 g Gross wt 3.7793 g age Gross wt 3.7793 g of beaker 3.7183 3AO tone blank
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt g Gross wt g Gross wt 3.7/93 g age Gross wt
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g Gross wt 3.7/93 g age Gross wt 3.7/93 g of beaker 3.7/83 pao tone blank erinse (m <sub>s</sub> ) 0.00/0
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 gross wt 3.7/93 gross wt gross wt 3.7/93 gross wt 3.7/83 gross
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt                                Date and time of wt  Date and time of wt  Date and time of wt  Note: In no case should a blank residering the sample weight.	(less than 2.5 micron)  tainer number	Gross wt 3.7/93 gross wt 3.7/93 gross wt gross wt 3.7/93 gross wt 3.7/83 gross
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	(less than 2.5 micron)  Itainer number	Gross wt 3.7/93 Gross wt 3.7/93 Gross wt 3.7/93 Gross wt 3.7/93 age Gross wt 3.7/93 of beaker 3.7/8/3 arone blank crinse (m) 0.00/0
Acetone rinse volume (V <sub>a</sub> w)  Acetone blank residue concentration  W <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ) (  Date and time of wt	(less than 2.5 micron)  Itainer number	Gross wt 3.7/93 gross wt 3.7/93 gross wt gross wt 3.7/93 gross wt 3.7/83 gross

Plant <u>Air Control Tech/V</u> Sample Location		Run Number FC-2
Relative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM 2.5 Filte	r yez
	Back-half Filter	
Filter container number	017	
Date and time of wt ///23 Date and time of wt Date and time of wt Date and time of wt	196 2301 15AV	Gross wt 0.0733 g Gross wt 0.0734 g Gross wt g Gross wt g Average Gross wt 0.0734 g
	T Weight of parti	are wt of filter 0.0654 g culate on filter 0.0080 g
Total weight of particulate	0.0085 + 0.0282	+ 0.0015 = 0.0377 g
Note: In no case should a ble from the sample weight.  Remarks  Signature of analyst Signature of reviewe		ne weight of acetone used be subtracted

lant Aircontrol Tech/	Vulcan Charlotte, NC	Run Number	FC-2
ample Location		···	
elative Humidity			
Sample Type	Sample label name	Liquid level n	
		container seal	ed
Acetone Rinse	410PM 10 7PM 2.5	arse della	June.
$PM_{10} > x > PM_{2.5})$		Por	Mpe m tape
Acetone Charles	/ 0.4 a < p	. , , , , ,	
PM <sub>2.5</sub> >x)	LPM 2.5 Runs	e + 4g/c	m tane
		<i>V</i> -	
	E-out half At	_	
I	Front-half Aceton (less than 10 micron and greater		
			.AV
ont-half acetone container nu	umber <u>5859 94</u> 6 <u>2331 <i>1</i>94</u> 0	<u>5</u> mL	7/1/2222
ate and time of wt 11120176 ate and time of wt 11/27/96	6 1254 BAD	Gross wt	# 4.0092 g
ate and time of wt	1007 1000	Gross wt Gross wt	<del></del>
ate and time of wt	<del></del>	Gross wt	g
		Average Gross wt	4.0093 g
		Weige Oloss Mi	<u>4.0093</u> g
		Tare wt	2 4011 -
		Tare wt Wt of acetone blank	3.9811 g
	Weight of	Tare wt Wt of acetone blank particulate in acetone	3.9811 g g 0.0282 g
ack-half acetone rinse a	Acetone Rinse (less than 2.5 micro	Wt of acetone blank particulate in acetone on)	g
cetone rinse volume (V,w)	Acetone Rinse (less than 2.5 microcontainer number 585	Wt of acetone blank particulate in acetone on)	g
cetone rinse volume (V <sub>w</sub> ) cetone blank residue concen	Acetone Rinse (less than 2.5 microcontainer number585tration (C)	Wt of acetone blank particulate in acetone on)	g
cetone rinse volume $(V_*w)$ cetone blank residue concent $V_* = C_*V_*w = ($	Acetone Rinse (less than 2.5 micro  Container number 585  25 mc  tration (C) (C) (C)	Wt of acetone blank particulate in acetone  on) (_ ) =	g 
cetone rinse volume $(V_*w)$ cetone blank residue concent $V_* = C_*V_*w = ($ ate and time of wt $\frac{    _{L_*}  _{L_*}}{   _{L_*}  _{L_*}}$	Acetone Rinse (less than 2.5 microcontainer number 35 5 microtration (C) (196 2320 840	Wt of acetone blank particulate in acetone  on)  Gross wt	g 0.0282 g
cetone rinse volume ( $V_a$ w) cetone blank residue concent $V_a = C_aV_a$ w = ( ate and time of wt $\frac{11/2}{27/2}$ ate and time of wt	Acetone Rinse (less than 2.5 micro  Container number 585  Assume tration (C) (190 2320 840	Wt of acetone blank particulate in acetone  on)  ( ) = Gross wt; Gross wt;	g <u>0.0282</u> g mi mi 3.3339 g 3.3337 g
cetone rinse volume ( $V_a w$ ) cetone blank residue concent $V_a = C_a V_a w = ($ ate and time of wt $\frac{11   2   b }{27   4 }$ ate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 35 5 microtration (C) (196 2320 840	Wt of acetone blank particulate in acetone  on)  Gross wt Gross wt Gross wt	g <u>0.0282</u> g mi mi 3.3339 g 3.3337 g g
cetone rinse volume ( $V_*w$ ) cetone blank residue concent $V_* = C_*V_*w = ($ ate and time of wt $\frac{11 2 6}{2 1 2 7 6}$ ate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 35 5 microtration (C) (196 2320 840	Wt of acetone blank particulate in acetone  on)  Gross wt Gross wt Gross wt Gross wt	g 0.0282 g mi mi 3.3339 g 3.3339 g 3.3337 g g
cetone rinse volume ( $V_a w$ ) cetone blank residue concent $I_a = C_a V_a w = ($ ate and time of wt $I_a   I_b   I_b  $ ate and time of wt $I_a   I_b   I_b  $	Acetone Rinse (less than 2.5 microcontainer number 35 5 microtration (C) (196 2320 840	Wt of acetone blank particulate in acetone  on)  Gross wt Gross wt Gross wt	g <u>0.0282</u> g mi mi 3.3339 g 3.3337 g g
cetone rinse volume ( $V_*w$ ) cetone blank residue concent $V_* = C_*V_*w = ($ ate and time of wt $\frac{11 2 6}{2 1 2 7 6}$ ate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 35 microtration (C) (196 2320 840 96 1313 840	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker	g 0.0282 g ml 3.3339 g 3.3337 g g 3.3339 g g g g g
cetone rinse volume ( $V_*w$ ) cetone blank residue concent $V_* = C_*V_*w = ($ ate and time of wt $\frac{11 2 6}{2 1 2 7 6}$ ate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 35 microtration (C) (196 2320 840 96 1313 840	Wt of acetone blank particulate in acetone  on)  Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank	g 0.0282 g ml 3.3339 g 3.3337 g g 3.3339 g g g g g
cetone rinse volume (V <sub>w</sub> ) cetone blank residue concent $V_{\bullet} = C_{\bullet}V_{\bullet}w = ($ ate and time of wt $\frac{11 2 }{27 4}$ ate and time of wt	Acetone Rinse (less than 2.5 microtainer number	Wt of acetone blank particulate in acetone  on)  Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank	g 0.0282 g ml ml 3.3339 g 3.3339 g 3.33338 g 3.3323 g
cetone rinse volume (V <sub>a</sub> w) cetone blank residue concent V <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( sate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 585 mc. tration (C) ) (196 2320 840 96 1313 840 Weight of particulate	Wt of acetone blank particulate in acetone  On)  Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)	g 0.0282 g ml 3.3339 g 3.3339 g 3.3339 g 3.3338 g 3.3323 g
cetone rinse volume (V <sub>a</sub> w) cetone blank residue concent  V <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( late and time of wt //   27/2 late and time of wt //   27/2 late and time of wt //   28/2 late and time of	Acetone Rinse (less than 2.5 microcontainer number 585 mc. tration (C) ) (196 2320 840 96 1313 840 Weight of particulate	Wt of acetone blank particulate in acetone  On)  Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)	g 0.0282 g ml 3.3339 g 3.3339 g 3.3339 g 3.3338 g 3.3323 g
cetone rinse volume (V <sub>a</sub> w) cetone blank residue concent V <sub>a</sub> = C <sub>a</sub> V <sub>a</sub> w = ( ate and time of wt	Acetone Rinse (less than 2.5 microcontainer number 385 microtration (C) (196 2320 840 96 1313 840)  Weight of particulate with residue > 0.01 mg/g or 0.001%	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)  of the weight of acetone to	g
cetone rinse volume (V,w) cetone blank residue concent V = C,V,w = ( ate and time of wt ///27/4 ate and time of wt ate and time of wt ate and time of wt one and time of wt ate and time of wt	Acetone Rinse (less than 2.5 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)  Weight of particulate with residue > 0.01 mg/g or 0.001% and salso included a greater than 10 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)  of the weight of acetone to	g
cetone rinse volume (V,w) cetone blank residue concent v = C,V,w = ( ate and time of wt	Acetone Rinse (less than 2.5 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)  Weight of particulate with residue > 0.01 mg/g or 0.001% and salso included a greater than 10 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)  of the weight of acetone to	g
cetone rinse volume (V,w) cetone blank residue concent v = C,V,w = ( ate and time of wt // \( \frac{1}{2}\) \( \frac{1}{2}\) ate and time of wt ate and time of sample weight.	Acetone Rinse (less than 2.5 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)  Weight of particulate with residue > 0.01 mg/g or 0.001% and salso included a greater than 10 microtainer number 585 microtration (C) (196 2320 840 96 1313 840)	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)  of the weight of acetone to	g
cetone rinse volume (V,w) cetone blank residue concent  ( = C,V,w = ( ate and time of wt ///27/ ate and time of wt ate and time of wt ate and time of wt ote: In no case should a bla om the sample weight. emarks This set of samples	Acetone Rinse (less than 2.5 microtainer number	On)  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  Wt of acetone blank in acetone rinse (m,)  of the weight of acetone to	g

Plant Air Control Tech/Vulc Sample Location Relative Humidity		Run Number FC-3
Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter		
	Back-half Filter	
Filter container number	<u>o</u>	
Date and time of wt 11123194  Date and time of wt 71 24/94  Date and time of wt  Date and time of wt	6 2302 DAD	Gross wt 0.0740 g Gross wt 0.0740 g Gross wt
	Weight of pa	Tare wt of filter O.0683 g rticulate on filter O.059 g  BAD
Total weight of particulate	0.0057 + 0.0186	+ 0,0003 = 0,00 0.0246 g
Note: In no case should a blank from the sample weight.  Remarks	residue >0.01 mg/g or 0.001% of	the weight of acetone used be subtracted
Signature of analyst		en en

Sample Location	Vulcan Charlotte, NC	Run Number <u>FC-3</u>
ample Location elative Humidity		
Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	LIOPM 10 7 PM 2.5 E	Cense + eften tope
Acetone Resident (PM <sub>2.5</sub> >x)	LPM 2.5 Rusie	Cense + eflor tope leftor tope
Front-half acetone container nu Date and time of wt 1/26/96 Date and time of wt 1/26/96 Date and time of wt	6 2.337 BAD	·
Date and time of wt	Wt of	Gross wt  Gross wt  Average Gross wt  3.8743  Tare wt  3.8557  acetone blank culate in acetone  0,0/86  g
	Acetone Rinse	
Acetone rinse volume (Vw)	Container number 5846	
Acetone rinse volume (V <sub>w</sub> ) Acetone blank residue concent W = C <sub>v</sub> V <sub>w</sub> = ( Date and time of wt ///26/ Date and time of wt ///27/ Date and time of wt	ration (C) (96 2327 BAD	) =
Acetone rinse volume (V <sub>w</sub> ) Acetone blank residue concent W <sub>s</sub> = C <sub>s</sub> V <sub>w</sub> = ( Date and time of wt ///26/ Date and time of wt ///27/ Date and time of wt	ration (C) 36 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Tree
Acetone rinse volume (V <sub>w</sub> ) Acetone blank residue concent W <sub>s</sub> = C <sub>s</sub> V <sub>w</sub> = ( Date and time of wt ///26/ Date and time of wt ///27/ Date and time of wt	ration (C)  96 2327 BAD 96 1309 BAD	Tree of sections blank   Tree of sections blank   Tree of sections
Acetone rinse volume (V <sub>w</sub> ) Acetone blank residue concent W <sub>s</sub> = C <sub>s</sub> V <sub>w</sub> = ( Date and time of wt ///26/ Date and time of wt ///27/ Date and time of wt	Feontainer number 5844  20 m l  ration (C)  96 2327 BAD  96 1309 BAD  Ta	Tree of sections blank   Tree of sections   Tree
from the sample weight.	ration (C)  ration (C)  96 2327 BAD  96 1309 BAD  Weight of particulate in ac  nk residue > 0.01 mg/g or 0.001% of the salso included a greater than 10 micron	Gross wt 3. 3310 Gross wt 3. 3307 Gross wt Gross wt Gross wt Average Gross wt re wt of beaker 3. 3307 f acetone blank etone rinse (m <sub>s</sub> ) 0.0003

Sample Type	Sample label name	Liquid level marked and/or container sealed
Back-half Filter	LPM 2.5 filte	e yes
	Back-half Filter	
Filter container number <i>O</i>	02	
Date and time of wt ///19/9 Date and time of wt ///20/9 Date and time of wt Date and time of wt	6 1454 BAD 6 15 15 BAD	Gross wt 0.0674 Gross wt 0.0672 Gross wt Gross wt Average Gross wt 0.0673
	Weight of par	Tare wt of filter 0.068/ rticulate on filter 0.008
Total weight of particulate _		
Note: In no case should a blan from the sample weight.	k residue >0.01 mg/g or 0.001% of	the weight of acetone used be subtracted

#### SAMPLE ANALYTICAL DATA FORM

Sample Type	Sample label name	Liquid level marked and/or container sealed
Acetone Rinse (PM <sub>10</sub> >x>PM <sub>2.5</sub> )	BIK	
Acetone & Filter (PM <sub>2.5</sub> >x)		
	Front-half Acetone ess than 10 micron and greater the	
Date and time of wt $\frac{11/26/9}{11/26/9}$	nber <u>5846 100</u> 36 2324 BAD 36 1319 BAD	Gross wt 3.5850 Gross wt 3.5851 Gross wt
Date and time of wt	<del> </del>	
Date and time of wt	Wi	Gross wt Average Gross wt Tare wt of acetone blank rticulate in acetone
Date and time of wt  Back-half acetone rinse and filte	Wi	Average Gross wt 3.5851  Tare wt 3.5850  of acetone blank rticulate in acetone 0.000/
Back-half acetone rinse and filte	Weight of pa  Acetone Rinse (less than 2.5 micron) er container number	Average Gross wt 3.5851  Tare wt 3.5850  of acetone blank rticulate in acetone 0.000/
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra	Weight of pa  Acetone Rinse (less than 2.5 micron) er container number	Average Gross wt 3.5851  Tare wt 3.5850  of acetone blank rticulate in acetone 0.000/
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra W, = C,V,w = ( Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number ation (C) ) ( ) (	Average Gross wt 3.5851  Tare wt 3.5850  of acetone blank rticulate in acetone 0.000/
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra W = C,V,w = ( Date and time of wt Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number ation (C) ) (	Average Gross wt 3.5850  Tare wt 3.5850  of acetone blank rticulate in acetone 0.000/
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra W = C,V,w = ( Date and time of wt Date and time of wt Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number  ation (C)  ) (	Average Gross wt  Tare wt  3.5850  of acetone blank rticulate in acetone  O.000/  Gross wt Gross wt Gross wt
Back-half acetone rinse and filter Acetone rinse volume (V,w) Acetone blank residue concentra W = C,V,w = ( Date and time of wt Date and time of wt Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number  ation (C)  ) (	Average Gross wt  Tare wt  3.5850  of acetone blank rticulate in acetone  O.000/  Gross wt Gross wt Gross wt Gross wt Gross wt Gross wt
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra W = C,V,w = ( Date and time of wt Date and time of wt Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number  ation (C)  ) (	Average Gross wt  Tare wt  3.5850  of acetone blank rticulate in acetone  O.000/  Gross wt Gross wt Gross wt
Back-half acetone rinse and filte Acetone rinse volume (V,w) Acetone blank residue concentra W = C,V,w = ( Date and time of wt Date and time of wt Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number  ation (C)  ) (	Average Gross wt 3.5850 Tare wt 3.5850 of acetone blank rticulate in acetone 0.000/  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  t of acetone blank
Date and time of wt	Acetone Rinse (less than 2.5 micron) er container number  ation (C)  ) (	Average Gross wt 3.5850 Tare wt 3.5850 of acetone blank rticulate in acetone 0.000/  Gross wt Gross wt Gross wt Gross wt Average Gross wt Tare wt of beaker  t of acetone blank

**p0**000026

# APPENDIX G.

## **CHAIN OF SAMPLE CUSTODY SHEETS**

			DEECO Inc				
			2404 Laboration Control of the Contr	Š	_		
			STORY LAKE WOODER			Date:	111 (96
			Haleign, NC Z/ou4	玄		Lab:	DEECO
			919-250-0285			Train:	M5/201A
	ć						
FIRM NAME: VOLCAN MAI ENIALS	٫		riani Localion;			Project Name: 96-1402	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
May May		76////		_	20:01		
Mad. Mari		dy/,,/h,	Pulha Alleber	Jiec.	11/5/40		
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
			ļ				
Relinquished by: (Signature)		<b>Date/Тіте</b>	Received by: (Signature)		Date/Time	Comments	
Field Sample	Date	Сотроѕіве	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
No.		or Grab					
Ţ.		Composite	PARTICULATE MATTER	M5/201A	ARCHIVE	-	DEECO
			-	_	ARCHIVE		
<u>5</u>		Composite	PARTICULATE MATTER	M5/201A	<10PM10->PM2.5 RI	_	DEECO
	+				<10PM10->PM2.5 R1	-	
<u>1</u> 01		Composite	PARTICULATE MATTER	M5/201A	<pm2.5 p="" rinse<=""> <pm2.5 p="" rinse<=""></pm2.5></pm2.5>		DEECO
<u>1</u> 2		Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" td=""><td>Tight army Logina</td><td>DEECO</td></pm2.5>	Tight army Logina	DEECO
	<b>&gt;</b>		,	•	<pm2.5 filter<="" td=""><td>eloop (n.p. e.</td><td>•</td></pm2.5>	eloop (n.p. e.	•
10.2	21/11	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE	-	DEECO
					ARCHIVE		
<u> </u>	<u></u> -	Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 FII &lt;10PM10-&gt;PM2.5 FII</pm1010->		DEECO .
23	_	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" td=""><td></td><td>DEECO</td></pm2.5>		DEECO
0	_		_		< PM2.5 RINSE		-
<del>3</del>	:: <b>&gt;</b>	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" td=""><td>χο,</td><td>DEECO</td></pm2.5>	χο,	DEECO
3				-	<pm2.5 filter<="" td=""><td>,</td><td>-</td></pm2.5>	,	-
001							

			DEECO, Inc	o			
			3404 Lake Woodard Dr.	rd Dr.		Date:	111 /96
			Raleigh, NC 27604	04		Lab:	
			919-250-0285			Train:	M5/201A
Plant Name: VULCAN MATERIALS	Ø		Plant Location:			Project Name: 96-1402	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
100 x 100 2					07:01		
Man. Laget			Making Menter	Wer	11/15/40		
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Relinquished by: (Signature)		Date/Ilme	Received by: (Signature)		Date/Time	Contraents	
(Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
		····					·
Field Sample	Date	Composite	Analysis Required	Sampling Train	Sample Description	Special Notes	de.3
No.		or Grab					
10-3	11/13	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE		DEECO
10.0		1100	Table of the Asset		Anchive		
~		couposie	PARIICOLATE MATTER	M5/201A	<pm1010->PM2.5 HI &lt;10PM10-&gt;PM2.5 RI</pm1010->		DEECO
10-3		Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" td=""><td></td><td>DEECO</td></pm2.5>		DEECO
	-		-	_	<pm2.5 rinse<="" td=""><td></td><td>-</td></pm2.5>		-
<u>بر</u>	<del>&gt;</del>	Сотровіте	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER	¥	DEECO
TP-1	 	Сотровіте	PARTICULATE MATTER	M5/201A	ARCHIVE		DEECO
	:		-	-	ARCHIVE	•	
<u></u>	_ _	Сотровіте	PARTICULATE MATTER	M5/201A	<pmt010->PM2.5 RI</pmt010->	•	DEECO
	+			-	<10PM10->PM2.5 RI		
Ü	_	Сопровіта	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" td=""><td></td><td>DEECO</td></pm2.5>		DEECO
	<u> </u>	<u> </u>		_	<pm2.5 ainse<="" td=""><td>1 11-1 COOLUID CONT</td><td>_</td></pm2.5>	1 11-1 COOLUID CONT	_
0.1	÷	Composite	PARTICULATE MAITER	M5/201A	<pre><pm2.5 filter<="" pre=""></pm2.5></pre>	catch (Frit)	DEECO
002							

			DEECO. Inc	J			
			3404 Lake Woodard Dr.	rd Dr.		Date:	11/ /96
			Raielgh, NC 27604	8		Lab:	DEECO
			919-250-0285			Train:	M5/201A
			; ;				
Plant Name: VULCAN MATERIALS	2		Plant Location:		ı	Project Name: 96-1402	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Took 1 tregly			Bulgar Dewler	West	04/2//11		
Relinquished by: (Signature)		Date/Пте	Received by: (Signature)		Date/Time	Comments	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
:							
Refinquished by: (Signature)		Date/Ппе	Received by: (Signature)		Date/Time	Comments	
Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
	21/11	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE ARCHIVE		DEECO
TP-2		Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 FU &lt;10PM10-&gt;PM2.5 FU</pm1010->		DEECO
TP-2		Camposite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" p=""><pm2.5 p="" rinse<=""></pm2.5></pm2.5>		DEECO
ТР-2	<u>→</u>	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 <pm2.5="" filter="" filter<="" td=""><td>X .</td><td>DEECO</td></pm2.5>	X .	DEECO
179-3	61/11	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE ARCHIVE		DEECO '
1P.3		Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RI &lt;10PM10-&gt;PM2.5 RI</pm1010->		DEECO
ر للهج		Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<br=""><pm2.5 rinse<="" th=""><th></th><th>DEECO</th></pm2.5></pm2.5>		DEECO
•	· :	Composite	PARTICULATE MATTER	M5/201A	< PM2.6 FILTER < PM2.5 FILTER	οK	DEECO
0							

			DEECO, Inc				
			3404 Lake Woodard Dr.	d Dr.		Date:	11/ /96
			Raielgh, NC 27604	4			DEECO
			919-250-0285		<del></del>		M5/201A
Plant Name: VIII CAN MATERIALS	ď		Plant t ocation:			Project Name: 96-1402	
					ľ		
Relinquired by: (Signature)  ToddT. Blogell		Date/Time 0950 11/19	Received by: (Signature)	de a.	Date/Time 10:00 11/21/9.	Comments	
Relinquished by: (Signature)		Date/Ime	Received by: (Signature)			Comments	
·							
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		<b>Дазе/Тіпс</b>	Comments	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Ilme	Comments	
Field Sample No.	Date	Composite or Grab	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
	8/1	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE		DEECO
V8-1		Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RL &lt;10PM10-&gt;PM2.5 RI</pm1010->	light	DEECO
V8-1		Composite	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER < PM2.5 RINSE		DEECO
VS-1	<b>&gt;</b>	Composite	PARTICULATE MATTER	M5/201A		Ifght 2.5710 Rivse	DEECO .
V8-2	bJ/II	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE ARCHIVE		DEECO
V8-2	<u>.</u>	Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RI &lt;10PM10-&gt;PM2.5 RI</pm1010->		DEECO
<u>D</u> gÚ		Composits	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" p=""><pm2.5 p="" rinse<=""></pm2.5></pm2.5>		DEECO
<b>U</b>	4	Composite	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER < PM2.5 FILTER		DEECO
] ]0							

			DEECO, Inc				
			3404 Lake Woodard Dr.	d Dr.		Date:	11/ /96
			Ralelgh, NC 27604	40	!	Lab:	DEECO
			919-250-0285			Train:	M5/201A
					. –	Project Name: 96-1402	-
Plant Name: VULCAN MAIEHIALS			Flant Location.		Ī		
Relinquished by: (Signature)		Date/Ilme	Received by: (Signature)		Date/Tige	Comraente	
Todd T. Bugoll		14 18 04 15	Baldia Deller	allee	11/21/90		
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Соптент	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
	<u></u>						
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Field Sample	Date	Composite	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
, cX		or Grab					
VS-3	92/11	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE ARCHIVE		DEECO '
V6-3	_	Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RI &lt;10PM10-&gt;PM2.5 RI</pm1010->	light Rinse	DEECO
VS-3		Composite	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER < PM2.5 FINSE		DEECO
VS-3	>	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 <pm2.5="" filter="" filter<="" th=""><th></th><th>DEECO</th></pm2.5>		DEECO
FC-I	8/12	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE		DEECO
<u> </u>	_	Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 FI &lt;10PM10-&gt;PM2.5 FI</pm1010->	CPM1010->PMZ.5 FII 'light Rinse	DEECO .
<u> </u>	-	Composite	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER < PM2.5 RINSE		DEECO
<u>G</u> O	>	Composite	PARTICULATE MATTER	M5/201A	< PM2.5 FILTER < PM2.5 FILTER		DEECO
0							

			DEFCO Inc				
			3404 Lake Woodard Dr.	D		Date:	11/ /96
			Raletch, NC 27604	4	•	Lab:	DEECO
			919-250-0285	•	<u> </u>	Train:	M5/201A
			•			Droinet Name: 96-1402	
Plant Name: VULCAN MATERIALS			Plant Location:		Γ	riojectivanie: 30-140E	
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Todd 7. Bugell		1510	Budne Rawley	ENJELC -	11/2/146		
Relinquished by: (Signature)		Date/Time	Received by: (Signature)		Date/Time	Comments	
Relinquished by: (Signature)		Date/Tlmc	Received by: (Signature)		Date/Time	Comments	
Relinquished by: (Signature)		<b>Date/П</b> пс	Received by: (Signature)		Date/Time	Comments	
Fleid Sample	Date	Composite	Analysis Required	Sampling Train	Sample Description	Special Notes	Lab
No.	1	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE		DEECO
FC-2	61/11	ellendino			ARCHIVE	-	
FC-2	_	Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RI</pm1010->	•	DEECO ,
	+		-		<10PM10->PM2.5 HI		DEFCO
FC-2	-	Composite	PARTICULATE MATTER	WS/201A	<pm2.5 filier<br=""><pm2.5 finse<="" th=""><th>•</th><th></th></pm2.5></pm2.5>	•	
FC-2	>	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" th=""><th></th><th>DEECO</th></pm2.5>		DEECO
					<pmz.5 filiek<="" th=""><th></th><th>COULC</th></pmz.5>		COULC
FG3	1/20	Composite	PARTICULATE MATTER	M5/201A	ARCHIVE	<u>- •</u>	DEECO
		Composite	PARTICULATE MATTER	M5/201A	<pm1010->PM2.5 RI</pm1010->	· light Kinse	DEECO
i 0	_				<10PM10->PM2.5 RI		_
9		Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" th=""><th>•</th><th>DEECO</th></pm2.5>	•	DEECO
0					<pm2.5 rinse<="" th=""><th></th><th>00000</th></pm2.5>		00000
<b>9</b> (	<del>-</del> >	Composite	PARTICULATE MATTER	M5/201A	<pm2.5 filter<="" th=""><th></th><th></th></pm2.5>		
](							

## APPENDIX H.

# STONE THROUGHPUT, PARTICLE SIZE DISTRIBUTION AND MOISTURE DATA SHEETS & CALCULATIONS

Plant Name: Vulcan	Materials Corporation	Client:	National Stone Association
Job Number 322	City State: Pineville,	North Carolina	Test Location: Conveyor C-
Date: 11/11/96	Run Number ඁ 🏥	aTC-1	Sample Time 14:10 .
Belt Length in feet Z	73 Seconds for 1 Rev	olution <u>35: 92</u> B	elt Speed feet/min 456
Pounds of stone/2foo	et sample 139.2 pound	ds Production Ra	ate Tons/Hour 952.

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 0.375 inch 9.5millingters	537.¶	2770.1	2232.2	65.L
2) 4 mesh 4.75millimetes	499.8	929.8	430.0	12.6
3) 40 mesh 425 microns	387.9	505.893.7	505.8	14.9
4) bomesh 150 microns	32/a.b	419.7	93.1	2.7
5) 200 mesh 75 microns	351.9	414.8	62.9	1.8
6) 400 mesh 38 microns	457.3	495.3	38	1.1
7)				1
Pan # 1	367.7	406.1	38.4	1.1
Pan #2				
Totals	N/A	N/A	3400.H	99.8

Circle Pan Used for Moisture Determination

1

2

C.) % Moisture = 
$$[(A - B)/(A)] * 100$$
 =  $0.78\%$ 

Plant Name: Vulcan Materials Corporation ... Client: National Stone Association City State: Pineville, North Carolina Test Location: Coveyor C. Job Number 322 Run Number <u>TP4TC- 2</u> Sample Time <u>11:25</u> Date: 1/12/96 Belt Length in feet 273 Seconds for 1 Revolution 35:92 Belt Speed feet/min 456

Pounds of stone/2 foot sample 108.3 pounds Production Rate Tons/Hour 740.8/889 (20%)

Pan Size	Tare Weight	Sample + Tare	Sample Alone	Wot need to be. % of Total	20% WNEX
1) 0.375" 9.5millineles	525.8	1710.3	1184.5	40.03.59.97	Refer to belt scale
2) Hmesh	500.0	781.2	ZB1.Z	14.24	20% good
3) 40mesh	387.2	741.6	354.4	17,94	beltscale 850-900
4) 120mesh	328.5	388.6	60.1	3.04	
5) Zoomesh	352.3	396.7	44,4	2.25	
6) Youresh	457.6	486.2	28.6	1.44	
7)					
Pan # 1	367.7	389.7	ZZ	1.11	i i
Pan #2					·
Totals	N/A	N/A	1975.2	99.99	

1992.8 A.) Sample Weight Wet - Pan Weight B.) Sample Weight Dry - Pan Weight

Circle Pan Used for Moisture Determination

C.) % Moisture = [(A - B)/(A)] \* 100

2

1

Plant Name: Vulcan	Materials Corporation	. Client: National	Stone Association
Job Number 322	City State: Pineville, N	North Carolina Test Locat	ion: <u>Carveyocc4.</u>
Date: 11/13/9/6	Run Number 🌃	TC-3 Sample Tin	ne <u>10:20</u> .
Belt Length in feet _6	273 Seconds for 1 Revo	lution <u>35:92</u> Belt Speed f	feet/min <u>456</u>
Pounds of stone/2foo	ot sample <u>151.3</u> pounds	Production Rate Tons/H	our <u>1034.9</u>

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 03751	537.1	2719.9	2182.8	63.II
2) 4mesh	516.2	1025.2	509.0	14.72
3) 4 <b>0</b> mesh	387.9	866.5	478.6	13.84
4) 100 mesh	326.5	434.6	108.	312
5) 200 mesh	352.0	442.2	90.2	2.61
6) 400 mesh	457.3	507.6	50.3	1.45
7)				
Pan # 1	367.7	407.3	39.6	1.14
Pan #2				
Totals	N/A	N/A	3458.4	99.99

Circle Pan Used for Moisture Determination

1

2

C.) % Moisture = 
$$[(A - B)/(A)] * 100$$
 =  $(A - B)/(A) = (A - B)/(A) = (A - B)/(A)$ 

Plant Name: Vulcan	Materials Corporation	, Client:	<u>National Stone Associa</u>	<u>tion</u>
Job Number 322	City State: Pineville, N	orth Carolina	Test Location: <u>Covveyor</u>	-20
Date: 11/18/96	Run Number FC-	<u>                                     </u>	ample Time <u>0940</u>	
Belt Length in feet	Seconds for 1 Revol	ution <u>41:98</u> Be	elt Speed feet/min <u>238</u>	
Pounds of stone/2foo	ot sample 69.9 pounds	Production Rat	te Tons/Hour 249.5	

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 0.375	537.1	1942.5	1405.4	48.83
2) No. 4	516.3	1179.0	662. <del>7</del>	23.02
3) No.40	388.\	990.5	602.4	75.53 20.93
4) No.100	326.5	399.4	72.9	2.53
5) No. 200	351.9	408.8	56.9	1.98
6) NO. 400	457.3	498.1	40.8	1.42
7)				
Pan # 1	367.7	404.8	37.[	1.29
Pan #2				
Totals	N/A	N/A	2878.2	100.0

Circle Pan Used for Moisture Determination

1 2

A.) Sample Weight Wet - Pan Weight = 2877.1.

B.) Sample Weight Dry - Pan Weight = 2879.1.

C.) % Moisture = [(A - B) / (A)] \* 100 = 0.666.

Plant Name: Vulcan	Materials Corporation	. Client: National Stone Association	
Job Number 322	City State: Pineville, No	orth Carolina Test Location: Conveyor 3	
Date: 11/18/96	Run Number VS-	Sample Time <u>15:40</u> .	1
Belt Length in feet _	Seconds for 1 Revolu	tionBelt Speed feet/min <u>553</u>	1
	1000	-12 2 /12 -	•

Pounds of stone/2 foot sample 182.3 pounds Production Rate Tons/Hour 1512.2 (1865 Toscreta)

Pan Size	Tare Weight	Sample + Tare	Sample Alone	** of Total
1) 0.375	537.1	4159.1	3622.00	81.19
2) #4	516.3	873.	356.8	7.99
3) 比40	388.1	687.4	299.3	671
4) #100	326.5	382.1	55.6	1.25
5) # 200	35 .9	405.2	53.3	1.19
6) # 400	457,3	505.8	48.5	1.09
7)				
Pan # 1	367.7	393.5	393.525.8	0.58
Pan #2				
Totals	N/A	N/A	4161.3	100.00

Circle Pan Used for Moisture Determination

1

2

C.) % Moisture = 
$$[(A - B)/(A)] * 100$$
 =  $0.5\%$ 

Plant Name: Vulcan	Materials Corporation	Client:	National Stone Association
Job Number 322	City State: Pineville,	North Carolina	Test Location: Conneyor 20
Date: 11/19/96	Run Number Fo	2-2	Sample Time 910
Belt Length in feet 1	Seconds for 1 Rev	volution41.98_F	Belt Speed feet/min 238
Pounds of stone/2foo	ot sample 71.3 poun	ds Production R	ate Tons/Hour <u>254.5</u>

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 0.375	537	2224.7	1687.6	46.64
2) #4	516.3	1351.9	835.4	23.09
3) # 40	388.1	1208.1	820.D	22.66
4) # 100	326.5	424.1	97.6	2.70
5) #200	351.9	433.9	82.0	2.27
6) #400	457.3	510.4	53.1	1.47
7)				
Pan # 1	367.7	409.9	42.2	1.16
Pan #2				
Totals	N/A	N/A	3618.10	99.99

Circle Pan Used for Moisture Determination

1 2

A.) Sample Weight Wet - Pan Weight = 3648.8

B.) Sample Weight Dry - Pan Weight = 369.7

C.) % Moisture = [(A - B) / (A)] \* 100 = 0.80

Plant Name: Vulcan	<u>Materials Corporation</u>	. Client: National Stone Association
Job Number 322	City State: Pineville,	North Carolina Test Location: Conveyor 3.
Date: 11/19/96	Run Number Number	VS-2 Sample Time 14:15
Belt Length in feet _	Seconds for 1 Re	evolutionBelt Speed feet/min

Pounds of stone/2 foot sample 182. pounds Production Rate Tons/Hour 1510.5 (686) to screet					
Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total	906.3
1) 0.375	537.	5851.6	5314.5	89.88	#3
2) #4	516.3	791.3	275	4.65	:
3) #40	388.1	561.9	173.8	2.93	0
4) # 100	326.5	373.5	47	0.79	
5) #200	351.9	396.1	44.2	0.75	
6) #400	457.3	488.5	31.2	٥.53	
7)					
Pan # 1	367.7	395, 2	27.5	0.47	
Pan #2					
Totals	N/A	N/A	5913.2	100.0	

1 2 Circle Pan Used for Moisture Determination 5938.8 A.) Sample Weight Wet - Pan Weight B.) Sample Weight Dry - Pan Weight C.) % Moisture = [(A - B)/(A)] \* 100

Plant Name: <u>Vulcan Materials Corporation</u> . Client: <u>National Stone Association</u>
Job Number 322 City State: Pineville, North Carolina Test Location: C-20
Date: 11/20/96 Run Number <u>FC-3</u> Sample Time <u>0845</u>
Belt Length in feet 166 Seconds for 1 Revolution 41.98 Belt Speed feet/min 238
Pounds of stone/2foot sample 70.7 pounds Production Rate Tons/Hour 252.4

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 0375	537.1	1914.3	1377.2	39.50
2) #4	516.3	1489.5	973.2	27.91
3) 440	388.1	1249.5	861.4	24.71
4) #100	326.5	424.5	98.0	2.8
5) # 200	351.9	428.4	74.5	2.19
6) #400	4573	514.3	57.0	1.63
7)				
Pan # 1	367.7	410.7	43	1.23
Pan #2				
Totals	N/A	N/A	3486.3	99.98

Circle Pan Used for Moisture Determination

1 2

A.) Sample Weight Wet - Pan Weight = 35/2.9

B.) Sample Weight Dry - Pan Weight = 3486.2

C.) % Moisture = [(A - B) / (A)] \* 100 = 0.76%

Plant Name: Vulcan	Materials Corporation	. Client: National Stor	<u>ie Association</u>	1
Job Number 322	City State: Pineville, No.	orth Carolina Test Location:	<u>c-3</u>	<u>+</u>
Date: 11/201960	Run Number VS-	Sample Time	10:40	1 4 1
Belt Length in feet _	Seconds for 1 Revolu	utionBelt Speed feet/	min <u>553</u>	
Pounds of stone/2foo	ot sample 225.7 pounds	Production Rate Tons/Hour	1872.2	(60%) two screen

Pan Size	Tare Weight	Sample + Tare	Sample Alone	% of Total
1) 0.375	<i>5</i> 37.\	5169.7	4632.6	82.67
2) #4	516.3	926.3	410.0	7.32
3) 半0	388.1	711.8	323.7	5. <del>78</del>
4) #100	326.5	410.3	83.8	1.49
5) #200	351.9	425.1	73.2	1.31
6) #40	4573	505 <sub>,</sub> Z.	47.9	0.85
7)				
Pan # 1	367.7	400.2	<i>3</i> 2.5	0.58
Pan #2				
Totals	N/A	N/A	5603.7	100.00

e Pan Used for Moisture Determination	1	2
A.) Sample Weight Wet - Pan Weight	=	<i>5632.5</i>
B.) Sample Weight <u>Dry - Pan Weight</u>	=	5605.8
C.) % Moisture = [(A - B) / (A)] * 100	=	0.47%

1123.3TPH

# APPENDIX I.

# AMBIENT $PM_{10}$ AND $PM_{2.5}$ DATA SHEETS

Plant Name: Vulcan Mate	rials Corporation Client:	National Stone Association	Job Number 322	City State
Pineville, North Carolina	50	30.0	1045	:
Wet Bulb 32	0 <sub>F Dry Bulb</sub> 34	0 <sub>F</sub> P <sub>BAR</sub> 30.0	0700	ć I
Relative Humidity 8	<b>0.9</b> % Moisture <u></u> ひ. し	<u>.</u>	- <del></del>	
Date: 111196	Run Number TPaTC	Observer <u>IIB</u>	<u>-</u>	

1318 1318 1309	39   1245 57   1321   1306	11/11/96	150'  Upwinnsfixtman  TP STACK  TP STACK  TC Stack  TC Stack	TWA  µg/m <sup>3</sup> 54. 5  3.38mg/m <sup>3</sup> 8.21mg/m <sup>4</sup>	TWA µg/m³ 22.2 1.47 mg/m³ 3. 3.67 mg/m³		\ \ \ \ \ \ \ \
1318 1318 1309	39   1245 57   1321   1305	11/11/96 11/11/96 11/11/96	UDWINDOFORMAN '' TP STACK TP STACK	54. 5 3.38malm³	22.2 1.47 mg/m³ 3.		レレ
138 138 138	39   1245 57   1321   1305	11/11/96 11/11/96 11/11/96	TP STACK	3 38ma.lm³	1.47 mg/m³ 3.		レレ
1318 1318 1305	57'  132   3/1306	11/11/96 11/11/96 11/11/96	TP STACK	3 38ma.lm³	1.47 mg/m³ 3.		レレ
1318 1303	13d   13d	11/11/96	TP CTAYK	3,38mg/m³ 8.21mg/m²	35.		レレ
1300	3/130%	11/11/96	TP STACK TC. Stack TC. STACK	3,38mg/m³ 8.21mg/m³	3.67m/m³ 8.A.ag/m³		V
1303	3/13/15 11315	11/11/96	TC Stock TC STACK	8.Umglm	3.67m/m³ 8:Azglm³		
131,	)   I	11/11/96	TC STACK	8.21mg nt	8.Avajin <sup>3</sup>		V
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Plant Name: Vulcan Mater	rials Corporation Client:	National Stone Association	Job Number 322	City State:
Pineville, North Carolina	43		10:36	; #
Wet Bulb 30	0F Dry Bulb <u>32</u>	<sup>0</sup> F PBAR 29.85	07:10	1
Relative Humidity 8	% Moisture <u>0.5</u>	<u>.</u>		:
Date: 11/12/96	_ Run Number TP9TC-2	Observer TIB	<del></del>	

Clock Time								1
200 feet from μg/m³ μg/m³   Plant Down   10:15/112  11/12/96   11/12/96	Clock Time	Date	Location	PM10	PM2.5	Ambient	Stack	1
0856/10:15 11/12/96 SECONDANC 21.9 Plant Down 10:15/1121 11/12/96 " 21.1 V 1127/1310 11/12/96 " 13.6 V 1345/1347 11/12/96 TP 1.6darg/n3 V 14/52/1405 11/12/96 TC 3.12 3 13 moles				TWA		N	V	
10:15/1121 11/12/96 " 21.1 V 1127/1310 11/12/96 " 13.6 V 1345/1347 11/12/96 TP 1.6darg/n3 V	,			μg/m <sup>3</sup>	μg/m <sup>3</sup>			
1127/1310 11/12/96 " 136 V 1345/1347 11/12/96 TP 1.6darg/n3 V	0856/10:15	11/12/96	SECONIMENIC.					Ylant Down
1127/1310 11/12/96 " 136 V 1345/1347 11/12/96 TP 1.6darg/n3 V	10:15/1121	11/12/96	11	21.		V		
1345/1347 11/1296 TP 1.6dargin3 14/02/1405 11/1296 TC 312 3 13malis	1127/1310	11/12/96	17		13.6	レ		, i
1402/405 11/2/46 TC 5.40 mg/s 1410/148 11/2/46 TP 3.15 mg/s 145/418 11/2/46 TP 3.15 mg/s		III iz Pilo	TP		1. Locargin3		V	
H 10   148   II   12   16   TP   3.15 mg/m³		11/12/96		3-12	3 13ml3			
НБ   ШВ   W   12   16   TP   3.15 mg   16   16   16   16   16   16   16   1			TC.	5.40 ma/3				
		11/12/96		315m/m3			1	
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I MINE INMINE. V GICAR MACCINALS	Jorporation Chem.	National Stone Association	Job Number 324	City State:
Pineville, North Carolina				
Wet Bulb 30 0F I	Orv Bulb 32	OF PRAR 29.6		:

Relative Humidity <u>80</u> % Moisture <u>0.5</u>.

Date: 11/13/96 Run Number TPATC-3 Observer TB.

Clock Time	Date	Location	PM10	PM2.5	Ambient	Stack
			TWA	TWA	1	√.
		200'from	μg/m <sup>3</sup>	μg/m <sup>3</sup>		
807-1010	11/13/96	SECONDARY CHEHR	<i>3</i> 4.2		V	
807 - 1010 013 - 1235	11/13/96	1		28.5	$\sim$	
	11/13/96	TP		1.08mg/m 2.55 mg/m³	3	\ \ \ \
	11/13/96 11/13/96	TC		2.55 ma/m3		$\checkmark$
	11/13/96	TE-TC	8.24 mg/m 5.40 mg/m³	•		ν-
	11/13/96	TP	5.40 mg/m3			V
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Plant Name: Vulcan Materials Corporation Client: I	National Stone Association Job Number 322 City State:
Pineville, North Carolina	·
Wet Bulb 49 0F Dry Bulb 54	0 <sub>F</sub> P <sub>BAR</sub> 29.5
Relative Humidity 70 % Moisture 1%.	Hazy, Rain Possible

Date: 11/18/96 Run Number V54FC-1 Observer TB.

952 Rain Drizzle lite 10:13 Shut Dwn walt Stack for raindress

						10:33 5H
Clock Time	Date	Location	PM10	PM2.5	Ambient	Stack
			TWA	TWA	<b>\</b>	√.
		200 from	_μg/m <sup>3</sup>	μg/m <sup>3</sup>		
0755/A20	11/18/96	SECONDARY		92.9	V	
0923/1014	11/18/196	))	197. 3		~	
12:30-1232	11/18/96 11/18/96 11/18/96 11/18/96	FixES Crusher Vibrating SoftEN FC.	1.83mg/m3			V
1235 - 1237	11/18/96	Vihratina STREEN	383 °			L
1246-1248	4/12/96	FC		1.14 mg/m	,,	~
12/48/1245	11/18/96	V5		232		~
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Plant Name: <u>Vulcan Materials Corporation</u> Client: <u>National Stone Association</u> Job Number <u>3.</u> <u>Pineville, North Carolina</u>	22 City State:
Wet Bulb 54 0F Dry Bulb 57 0F PBAR 29.2	1
Relative Humidity 81 % Moisture 1.4	
Date: 11/19/96 Run Number V5-FC-Z Observer TIB .	4 9 1

Clock Time	Date	Location	PM10	PM2.5	Ambient	Stack
			TWA	TWA	√	<b>V</b>
			μg/m <sup>3</sup>	μg/m <sup>3</sup>		
0836/1838	11/19/96	FC		789		V
340/0842	11/19/96	<b>V</b> 5	3	323		
0847/08/19	11/19/96	FC VS VS	848			1
0850/9852	11/19/96	l EC.	1.75mg/m³ 35.2			レ
0900/020	11/19/96	200' From	<b>3</b> 5.2		١	
1023/1141	11/19/96	SCCONDON		22 . 9	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	_
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Plant Name: <u>Vulcan Materials Corporation</u> Client: <u>National Stone Association</u> Job Number <u>322</u> City State: <u>Pineville, North Carolina</u>

Wet Bulb 51 0F Dry Bulb 53 0F PBAR 29.15

Relative Humidity 86 % Moisture 1.1

Date: 11/20/96 Run Number VC-F5-3 Observer TB

					bouthy (	cloudy
Clock Time	Date	Location	PM10	PM2.5	Ambient √	Stack
			TWA	TWA	√ .	<b>V</b>
			μg/m <sup>3</sup>	μg/m <sup>3</sup>		
0811 <i>[08]</i> 3	11/20/96	FC VS		765.7 837.2		V
0815/0817	11,50/96	VS		837.2		
08/5/19/7 0826/0822	11/20/96 11/20/96 11/20/96 11/20/96 11/20/96	VS FC	1.20mg/m 1.32mg/m 58.3			~
0823/0825	11/20/96	FC	1.32 mg/m			<b>└</b>
0830 09360	11/20/96	Zoo' Fram	<i>58</i> .3		1	
0938/1127	11/20/96	SECONDARY		42.7	<u> </u>	
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## APPENDIX J.

# VIBRATING SCREEN WIND SPEED AND DIRECTION DATA SHEETS

Plant Name: Vulcan Materials Corporation Client: National Stone Association Job Number 322

City State: Pineville, North Carolina

Date: W/18/96 Run Number V5-1 Observer IB/BP.

Stop Due to Rain

Time	Wind Speed mph	Wind Direction
0800		SW
0815 0830		SW
0830		sw
0845	· L	54.2
0830 0846 6900 0915 0930 0945	0	SW SW SW SW
0915	6	5W 5W 5W 5W 5W 5W 5W 5W
0930	4	SW
0945	1	<u>5</u>
1000 1015 1230 1245	1	5W
1015		$s\omega$
1230	2	SW
1245	1	5W
1300 1315 1330 1345 1400 1415 1430 1445 1500	物	Su
1315	6	עינו
1330	· 4	5W 5W
1345	6	<u>560</u>
1400	16	<b>9</b> EU
1415	3	Les
1430	3 4 .	<i>3</i> W
1445	વ	3W 5W
1500	B	Su >
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Plant Name: Vulcan Materials Corporation Client: National Stone Association Job Number 322

City State: Pineville, North Carolina

Date: 11-19-96 Run Number 18-2 Observer BRAM.

Time	Wind Speed	Wind Direction
0745	1	NE
0800	i i	NE N
0815		N
0830		N
0845		WNW
0900		NW
0800 0815 0830 0845 0900	{	NW NW NW
17730	0	$\omega$
0945	0	W
01000		N
D-1015		N
1030	Ż	N U
100 1115 1130 1145 1200 1215 1230 1245 1300 315	2 2 5	l D
1100	2	5W 5W
1115	*	<u>S</u> w
1136	0	N
1145	1	N
1200	3	νω ν ν
1215	3	<u>                                   </u>
12 30		1 No
1245	5	NW
1300	1 2	NE
1000	.3	NE E
1330	<i>C</i>	<u> </u>
1346	4	NW
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Plant Name: Vulcan Materials Corporation Client: National Stone Association Job Number 322

City State: Pineville, North Carolina

Date: 11/20/96 Run Number <u>V5-3</u> Observer <u>TTB/BLP</u>

Time	Wind Speed	Wind Direction
0745	_ 0	Ε
6800	0	E
0800 0815	0	l)
0830		N
0845	3	N/=
0900	3	WE
0915	5	NE
0845 0900 0915 0930	1	E E
10945	4	E
1000	2	NE
1015	1	NE
1000 1030	2	NE NE NE
1045 1100 1115 1130 1146	3	NE
1100	3	NE
1115	2	N
1130	0	2
1145	24	N
1200	3	N
1215	5	NE
1 (230	3	NF
1245	4	N
1300	2	NW
1315	0	N

## APPENDIX K.

# US EPA OAQPS/NCDEHNR CORRESPONDENCE

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# nsa

# National Stone Association

1415 Ellot Place, N.W., Washington, D.C. 20007-2599 202/342-1100

TO: Ron Myers

FAX #: 919/541-0684

COMPANY: US EPA OAQPS Emission Factors Development MD-14

FROM: Bill Ford

DATE: November 7, 1996

TOTAL PAGES:

(including cover sheet)

We transmit from 202-342-0702. If you do not receive the pages clearly, call me at 800-342-1415 or locally at 202-342-1100.

Just a reminder that PM2.4 particulate emissions testing is scheduled to get underway Monday, November 11, 1996 at Vulcan Material Co.'s Pineville Quarry. The quarry is located south of Charlotte, North Carolina off I-77 at Nations Ford Road. The contact person for Vulcan Materials Co. is Mike Poplin in Winston-Salem. He can be reached at 910/767-4600.

#### The schedule is as follows:

November 8 - 10 Tertiary crusher / transfer point set up

November 11 - 13 Tertiary crusher / transfer point testing

November 15 - 17 Vibrating screen set up

November 18 - 20 Vibrating screen testing

We also plan to gather preliminary test data on a fines crusher November 18 - 20 that will be used for planning future fines testing.

Test protocols using a cascade cyclone method will be the same as those approved for the earlier crusher, screen and transfer point tests, except that a nephelometer will be used to measure ambient PM<sub>10</sub> and PM<sub>2.5</sub>, eliminating the need for Hi-vols for the screen tests and HEPA filters for the crusher and transfer point make-up air. Three six-hour tests will be done on each source. These will be done under controlled conditions (wet suppression in use). We will not test under uncontrolled (dry) conditions. One filter from each source will be analyzed by Polarized Light Microscopy (PLM) to confirm that only particles less than 2.5 micrometers are present and to determine the organic and inorganic components of the PM<sub>2.5</sub>.

A copy of a memo from Fred Allen, North Carolina Aggregates Association, to Laura Butler inviting the North Carolina Air Program Staff to observe is attached for your information.

Please call either me, John Hayden, Dr. John Richards or Todd Brozell, Horacc Willson, Steve Whitt or Mike Poplin should you have questions or need more information. Hope you can visit the site.



November 5, 1996

NORTH CAROLINA AGGREGATES **ASSOCIATION** 

TO:

Laura Butler

FROM:

Fred Allen

SUBJECT:

Field Testing of Quarry Emissions

This will confirm our invitation for you, your staff or others from the Department or local programs to visit the site of sampling and testing for quarry dust emissions.

Beginning November 11, Dr. John Richards and Todd Brozell of Air Control Techniques, PC, will be sampling and testing tertiary crusher, screen and transfer point emissions at Vulcan Materials Co. Pineville (NC) Quarry, South of Charlotte off I-77 at Nations Ford

This field testing is being sponsored by the National Stone Association in cooperation with EPA to help determine both PM<sub>10</sub> and PM<sub>2.5</sub> emissions.

On behalf of Vulcan Materials Co. and the referenced associations, we welcome you to

For convenience of the operator, we ask that you visit on either Tuesday afternoon, November 12 or Tuesday anytime, November 19. Please call Mr. Mike Poplin of Vulcan Materials Co. to coordinate your visit. He may be reached in Winston-Salem at 910/767-4600. Of course, the testing schedule may vary due to weather, equipment, or other uncertainties, so please check with Mike before visiting.

The aggregate industry is serious about our efforts to know as much as possible about our emissions and to be able to effectively control particulate emissions. We welcome your participation and comments about this project.

cc:

Mike Poplin Horace Willson Bill Ford Dr. John Richards

Butler/emissions field test